

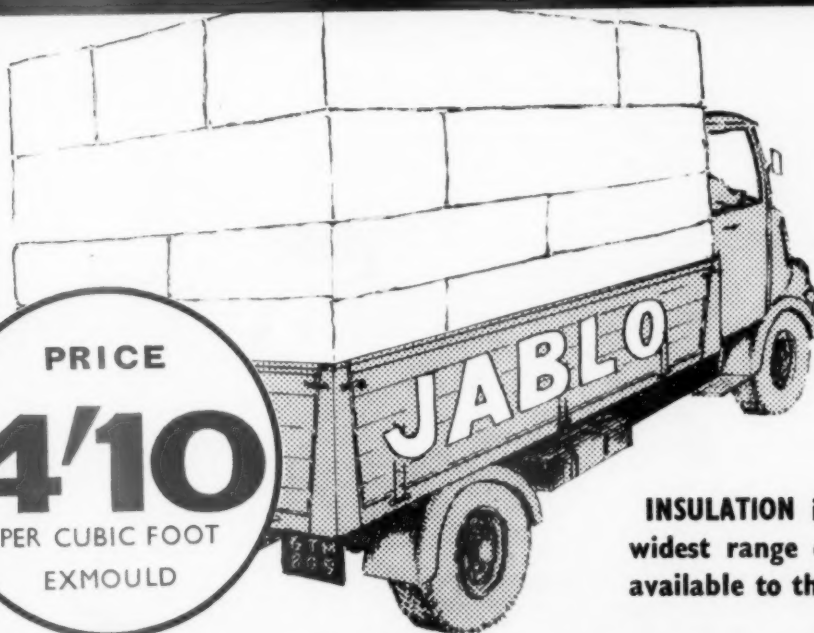
MODERN REFRIGERATION

AND AIR CONTROL

Vol. 64 No. 757

APRIL, 1961

Price 2s. 6d. monthly

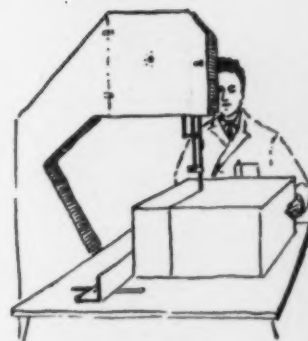


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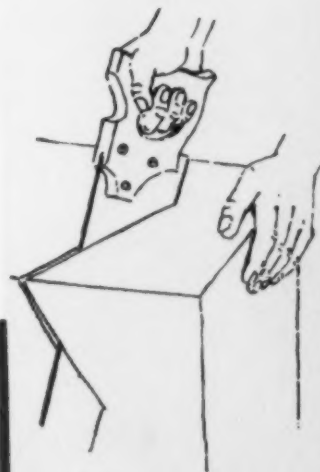
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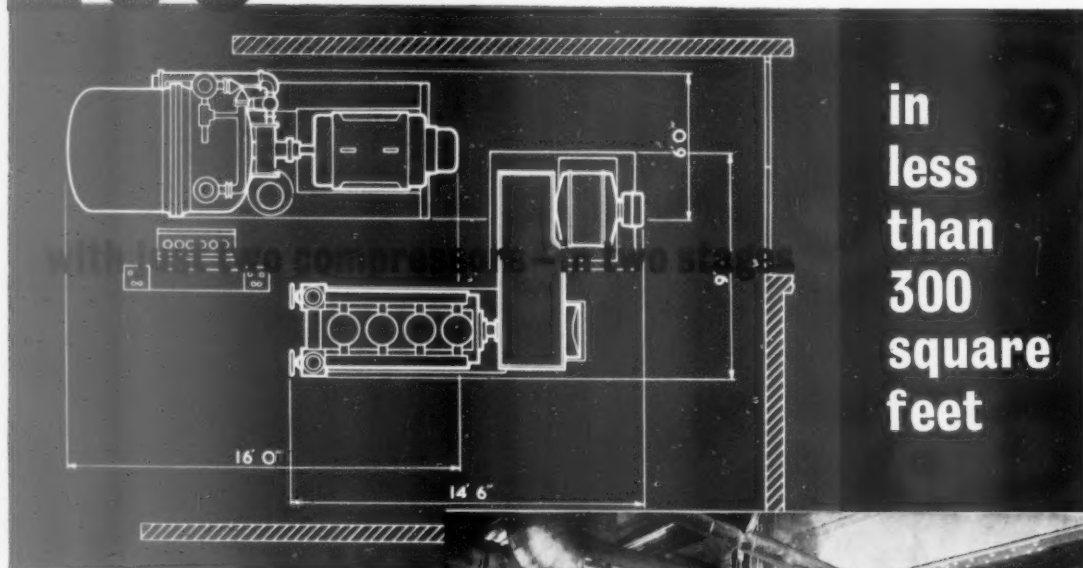
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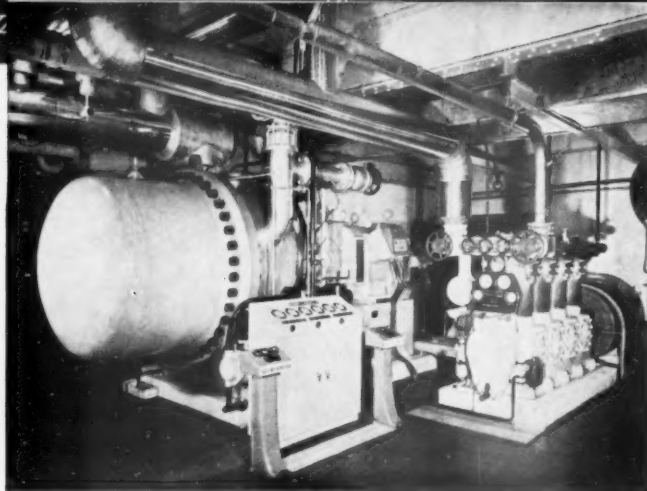
TONS OF REFRIGERATION AT -45°F



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The layout of this compressor set at the Great Yarmouth factory of Birds Eye Foods Ltd., shows how little space the rotary compressor needs. Here it works as a booster, at 8:1 compression ratio using ammonia, producing low temperature air blast for a quick freezing tunnel.

The UDEC/Howden rotary compressor is suitable for any refrigeration duty in industrial installations.



Photograph by courtesy of Birds Eye Foods Ltd.



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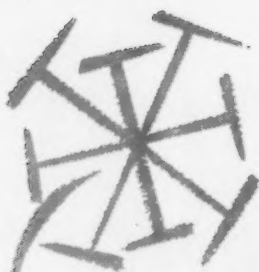
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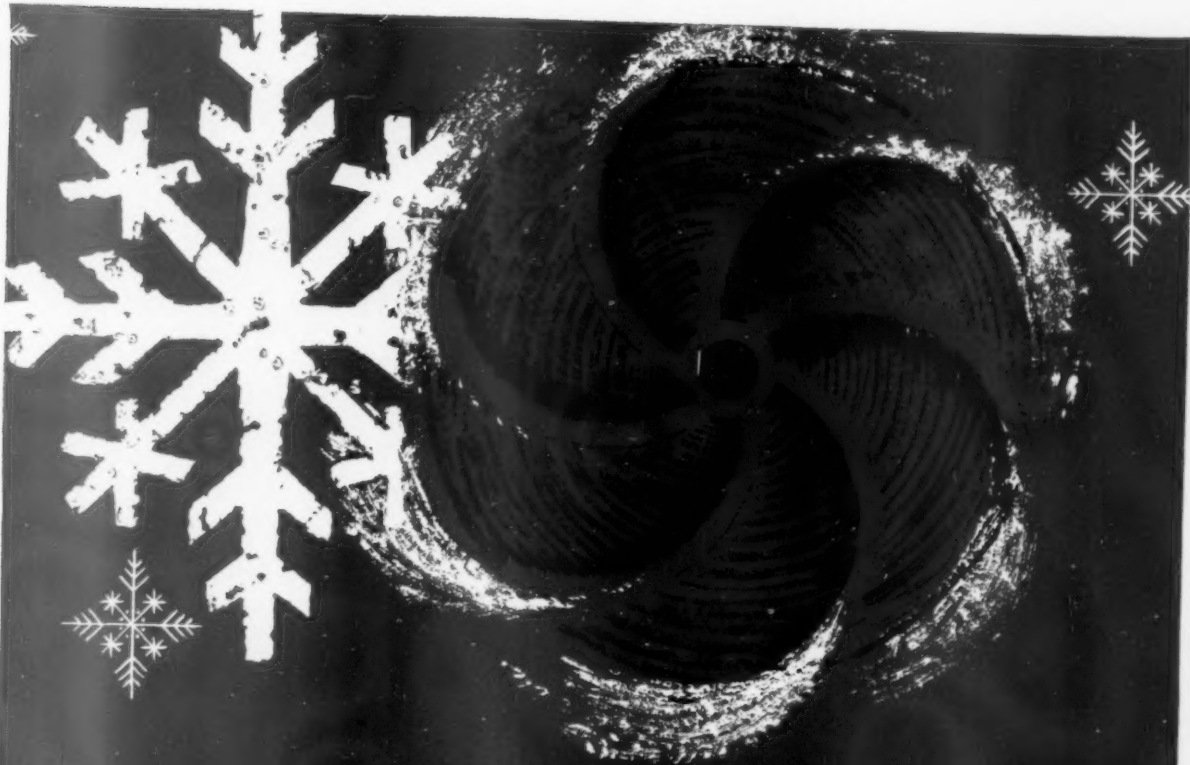
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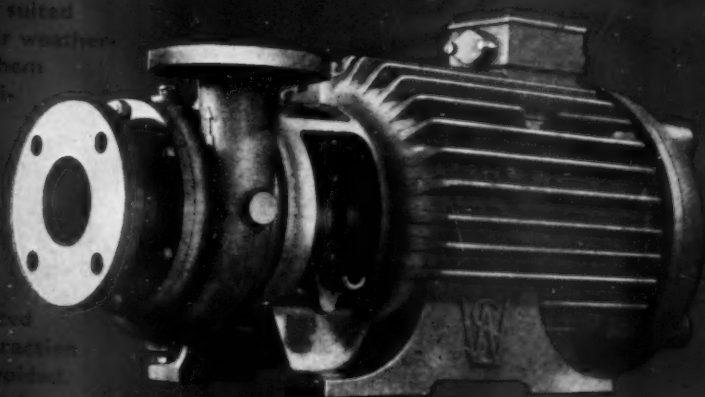
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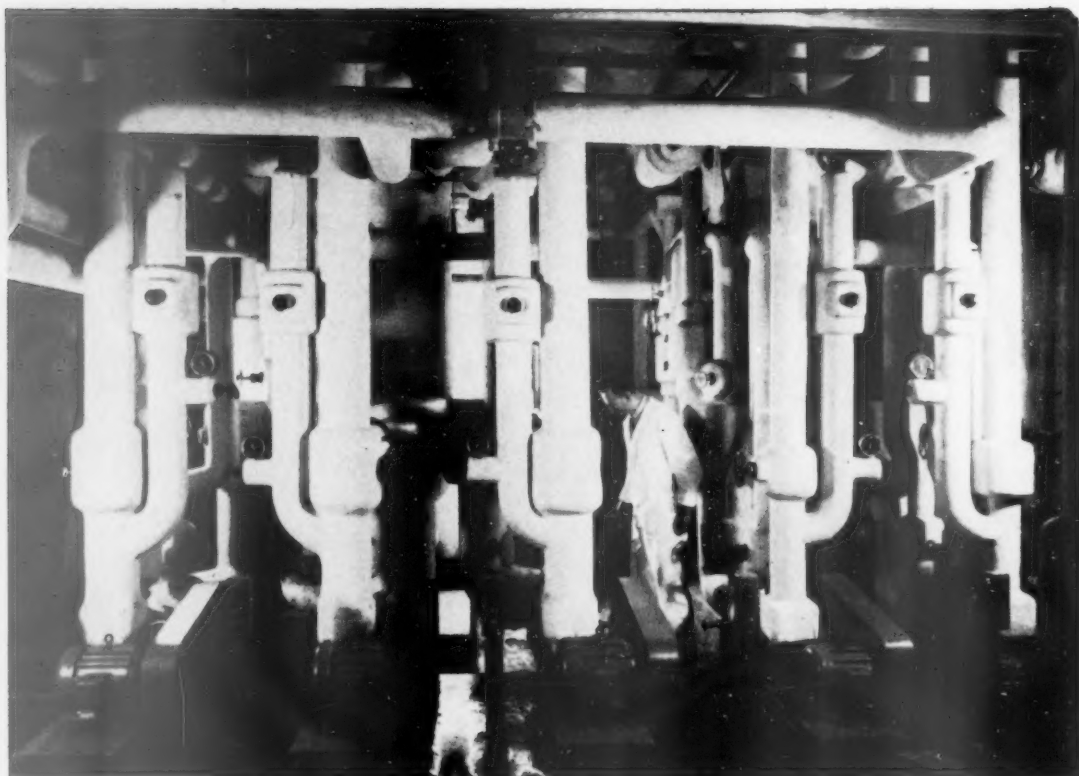
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helps to make **Lyons Maid** ice cream

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0.20 B.Th.U./sq.ft. hour °F./inch
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at 100°F (38°C) and 1-90%
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1.58 grains/sq. ft./24 hr./2 L.

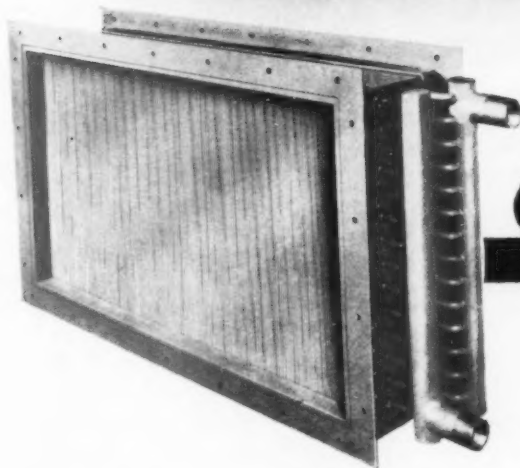
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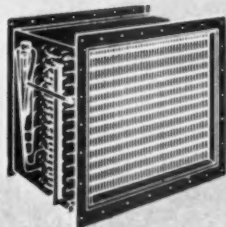
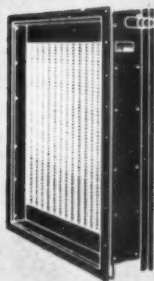
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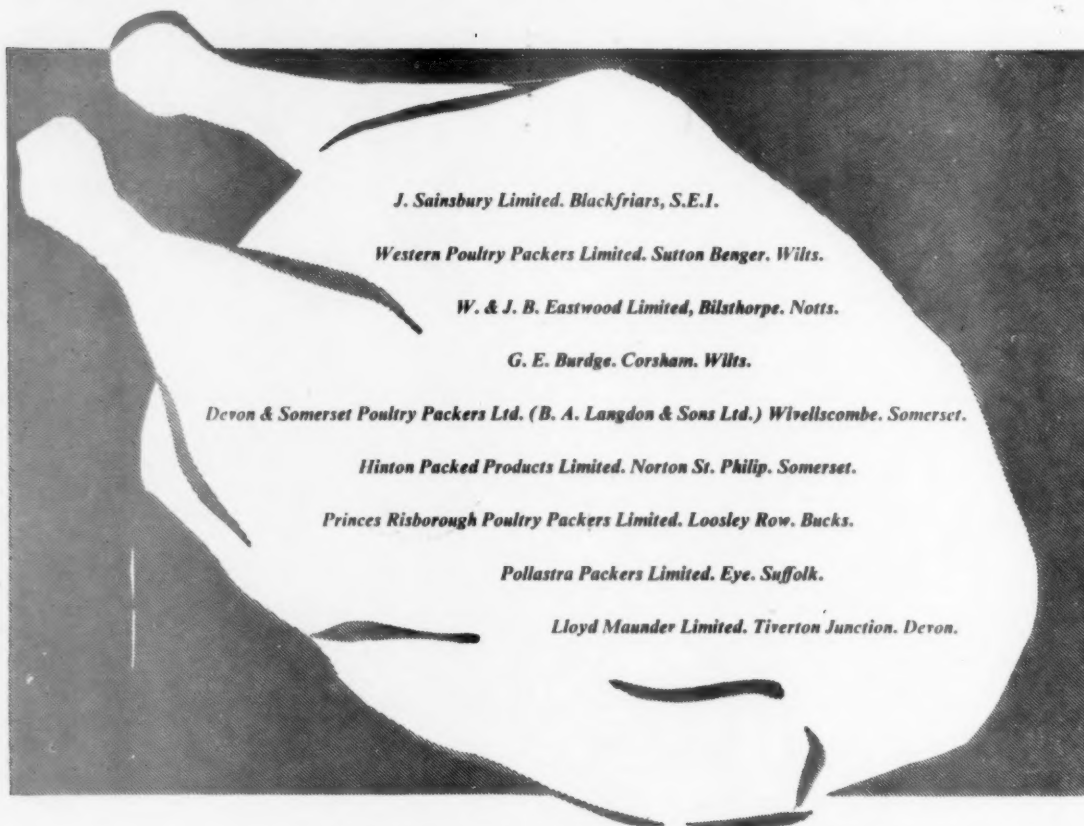
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refrigeration are made
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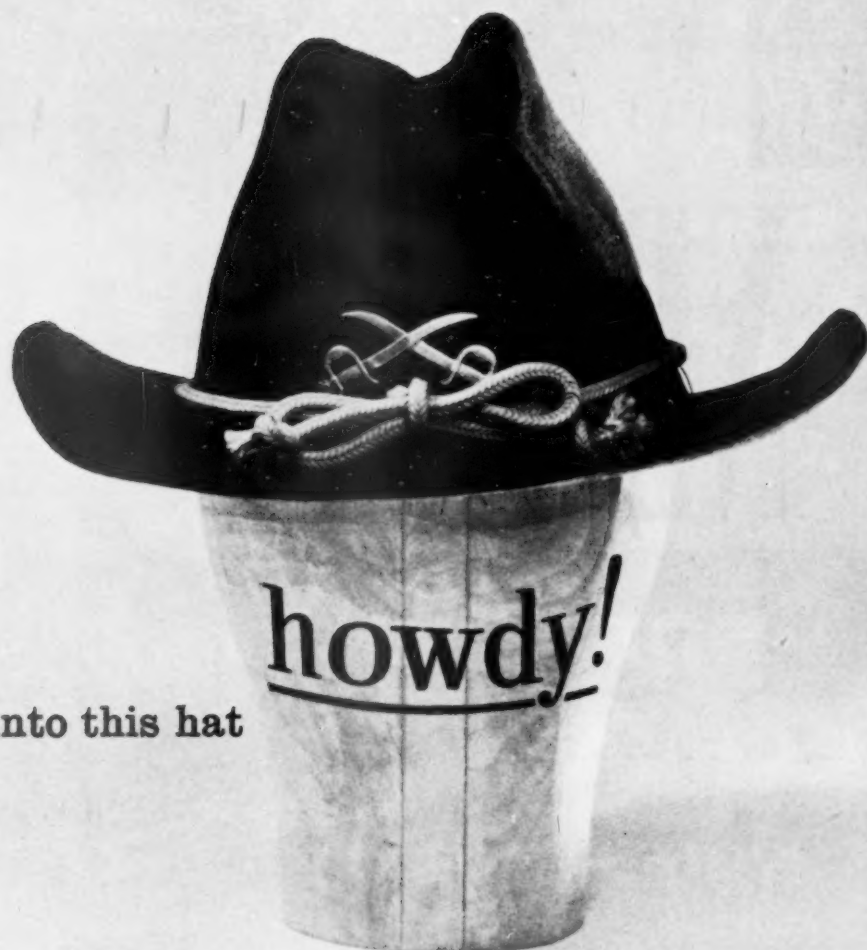


or how this feather . .

Tecumseh (pronounced with the accent on the 'cum') was a Redskin Shawnee chief who bit the dust about 150 years ago. He gave his name to the town of Tecumseh, Michigan, where the citizens, being industrious folk, started making the world's finest compressors. Now these compressors were so good that all the best manufacturers of refrigerators were soon getting hot and bothered just trying to get these machines. Almost overnight Tecumseh became so famous that these days the place is known as The Refrigeration Capital.

L STERNE & CO

(Licensees of Tecumseh Products Co. Mich. U.S.A.) KELVIN AVENUE, HILLINGTON, GLASGOW SW2



..... got into this hat

During the American Civil War (in which he played quite a part) a certain Mr. Louis Sterne was sent on a buying mission to Britain. He did his shopping in Glasgow, but while he was there Abe Lincoln was assassinated so Mr. Sterne stayed on and started making refrigeration machinery. By now you'll have guessed how the feather got into the hat. Mr. Sterne's successors tied up the exclusive manufacturing rights, in Great Britain, for Tecumseh compressors and both companies have been happy ever since.

*Tecumseh are the biggest manufacturers of
Refrigeration Compressors in the world—more than 50,000,000 are in use*

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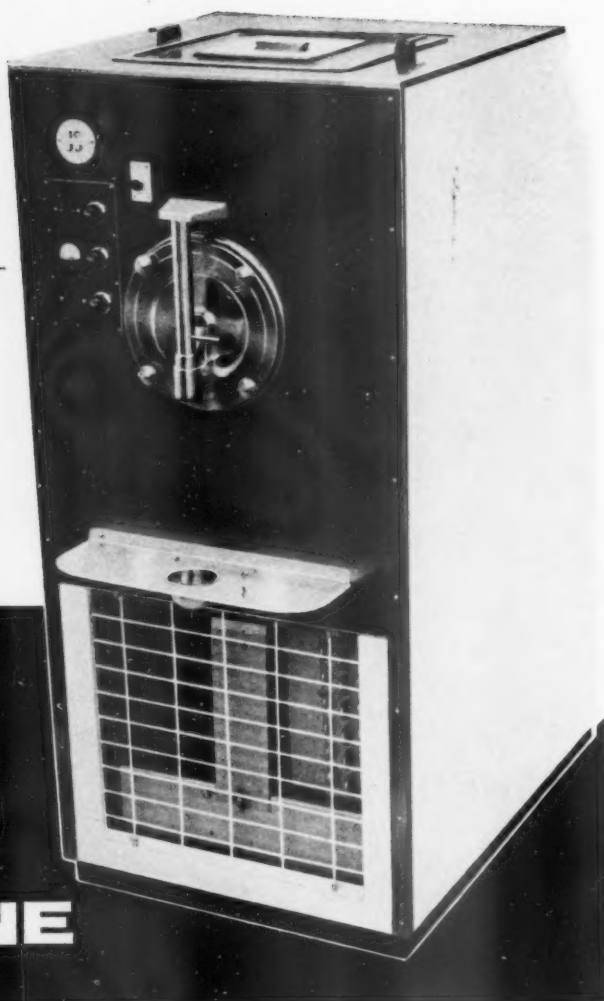
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ON STAND 18 REFRIGERATION &
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This machine has been designed to provide fully automatic, continuous production of soft ice cream. The mix, which is stored and pre-cooled in a refrigerated hopper, is fed into the freezer at the same rate as the finished product is dispensed from the head. Once the first batch is manufactured, ice cream is available all the time without interruption provided mix is fed into the hopper. During off-peak periods the ice cream is retained within the barrel in perfect condition ready at a moment's notice to meet any demand.

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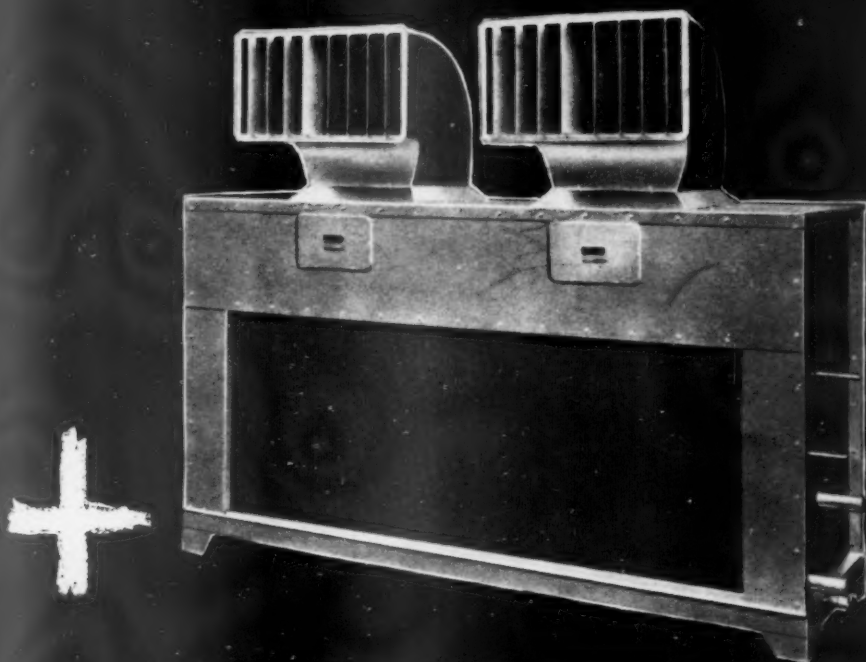
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everything adds up to you selecting a

and what a range! 96 standard models giving from 1,200 to 270,000 BTU's/hr. Some of these Unit Coolers, together with many other quality products will be on display at the 2nd International Refrigeration and Air-Conditioning Exhibition being held at Earl's Court, London, from April 11th to 14th, 1961.

April 1961 MODERN REFRIGERATION

quality



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cooler from the SEARLE-BUSH range

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Inquiries are invited from reliable firms in areas, where we are not yet sufficiently represented.



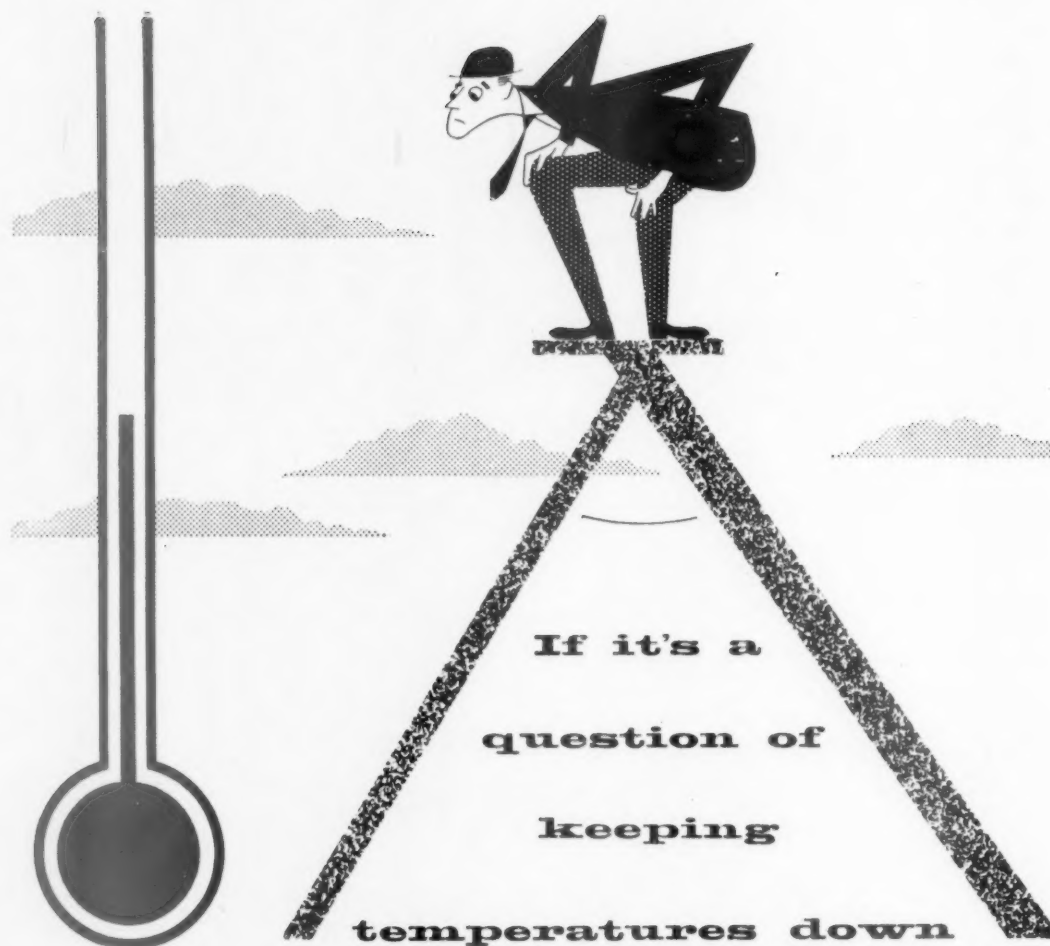
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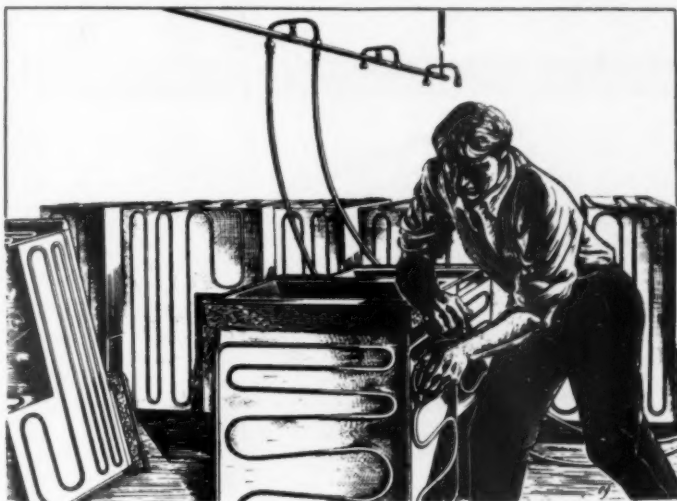
45

**YORKSHIRE
IMPERIAL**

**Refrigerator
Tubes**

ensure a

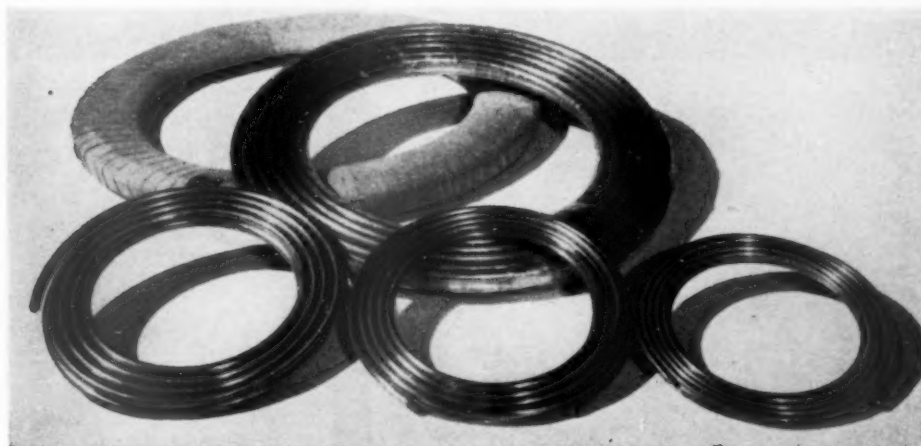
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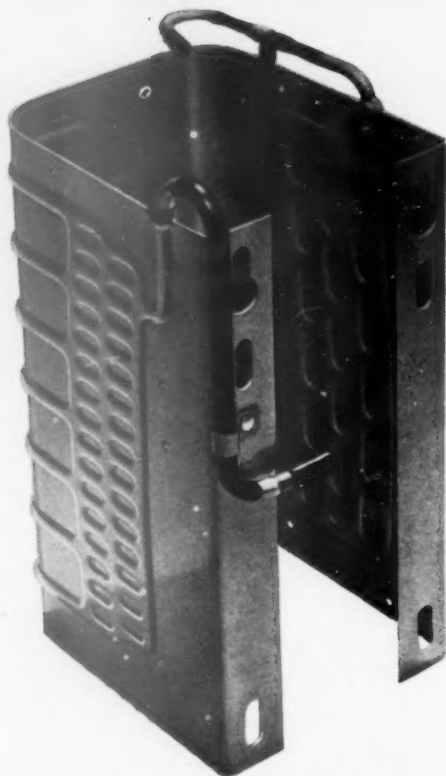
Yorkshire Imperial also manufacture restrictor and bulb-and-capillary tubing—and a range of special “Yorkshire” Fittings for refrigeration work.



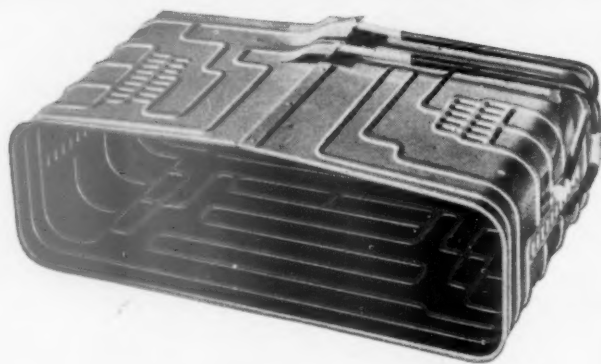
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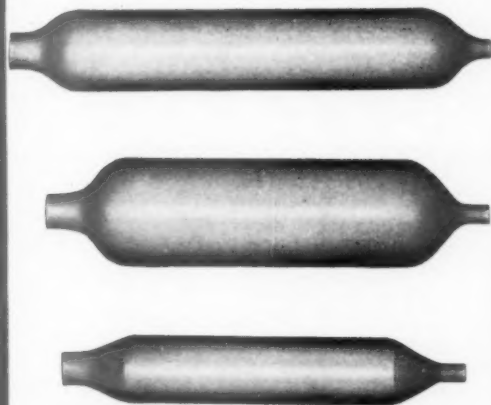


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MAR. 292

DAVID SCOTT

NEW MOLECULAR SIEVE DRIERS



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9

*times as
efficient as
standard driers*

This is good news for all sealed refrigeration system manufacturers. David Scott high side molecular sieve driers are now nine times more efficient than standard driers. With a desiccant consisting of a molecular sieve filled with type 4A 8 x 12 mesh beads, they have actually nine times the normal adsorption. Consider the economic advantage. With David Scott high side driers you save size and weight.

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Construction of these remarkable new driers is carried out in spun copper shell with a desiccant between two fine-mesh strainers. Outlets screen is of bag construction with secure retention in a brass ring pressing. This is formed from a 150 mesh twill weave wire cloth or equivalent in either phosphor bronze or monel.

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The greatest care is taken to ensure 100% efficiency. All driers are manufactured and stored in an air-conditioned atmosphere.

EASE AND SAFE TRANSPORTATION

Though there is the minimum risk of moisture adsorption from the surrounding atmosphere, David Scott new high side driers can be individually sealed before leaving the factory. All driers are shipped in hermetically sealed canisters.

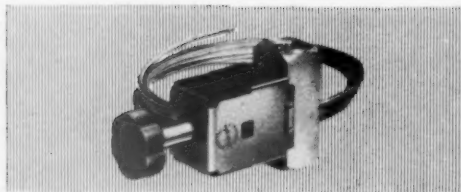
Inlet and outlet connections conform to manufacturers own requirements.

Other David Scott products include RECHARGEABLE DRIERS from $\frac{1}{4}$ " o/d to $1\frac{1}{2}$ " o/d pipe, and ACCUMULATOR DRIERS with copper shell squeezed and silver soldered at each end.

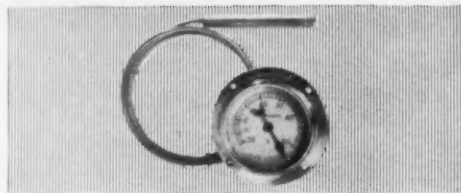
A special feature of the David Scott service is the manufacture of driers to clients own specifications.

DAVID SCOTT & CO. LTD.

KELVIN AVENUE, HILLINGTON, GLASGOW
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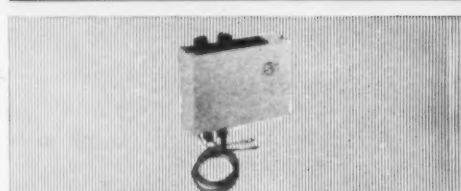
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EARLS COURT, LONDON
APRIL 11th—14th 1961

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- ★ In the ISOL range—6.5 cu.ft. to 20.5 cu.ft.—there is a model to suit the exact requirements of your customer.
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- * The units are powered by a self-contained engine. Models are also available with combined engine and electric power or with electric motor only.
- * Exclusive patent starter generator provides a money saving start or stop engine operation.
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- * Air is drawn from the cargo space then blown through the cooling coil and around the cargo.
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- * Designed to combine strength with lightness.
- * More cooling per pound of equipment than any other mechanical system.
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- * Uninterrupted use of the vehicle is ensured as the Thermo King unit can be replaced in a few minutes for routine overhaul on the shop floor.

**"AND
SIMPLEST
TO OPERATE!"**



- * SHOWING AT THE REFRIGERATION AND AIR CONDITIONING EXHIBITION, 1961, ON STAND NO. 54

A Thermo King Model M-20D is installed in this Mann Egerton insulated van body on a Morris chassis built for Boveys (Wiltshire Bacon) Ltd.



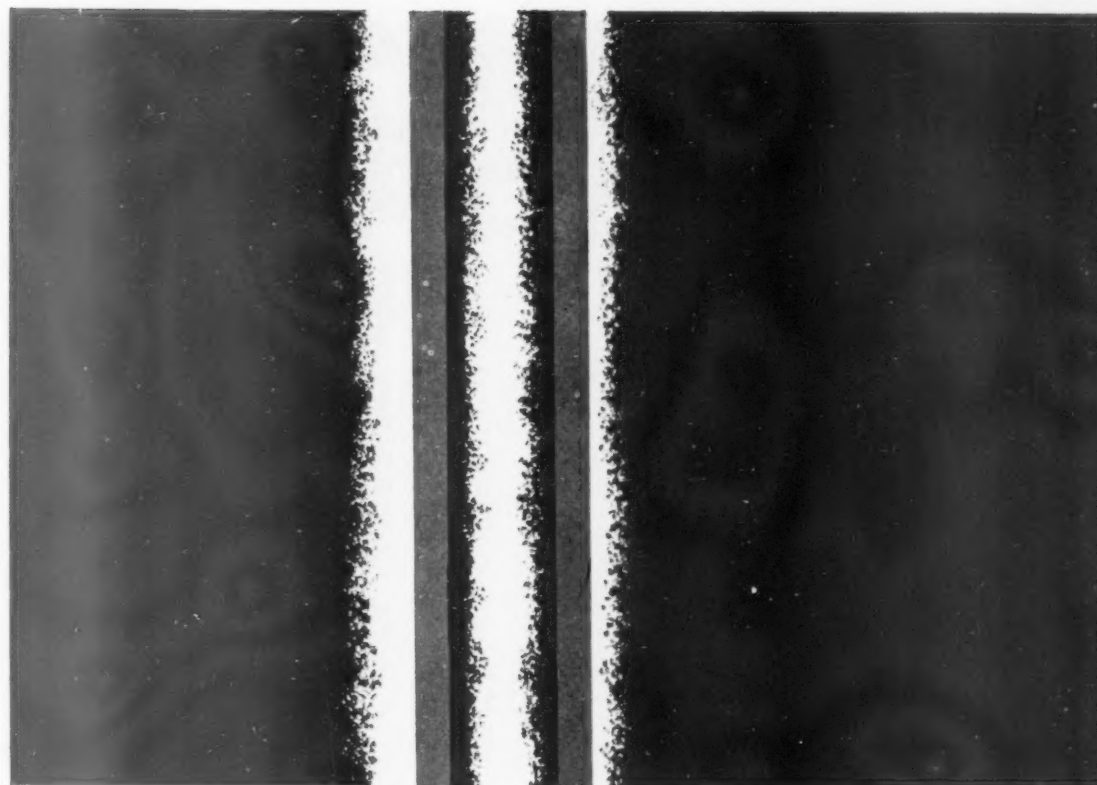
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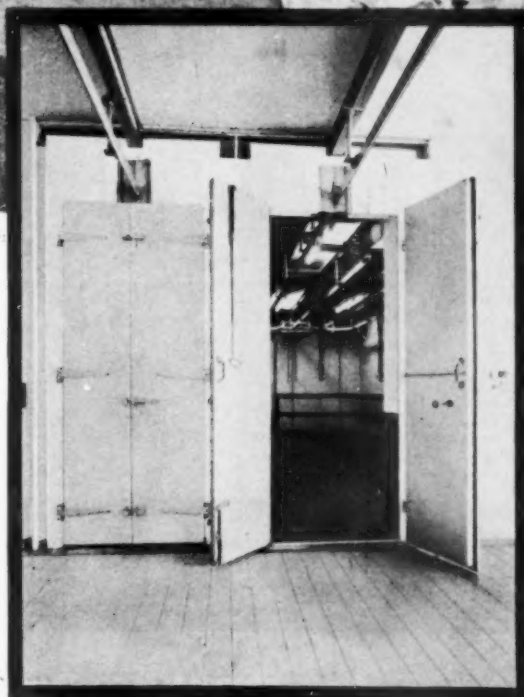


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Right: Interior of one of the chillers.

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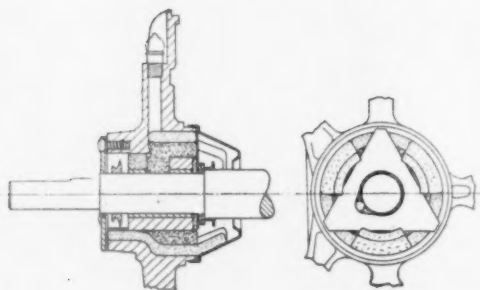
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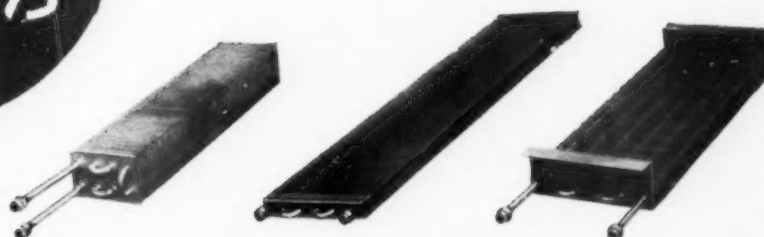


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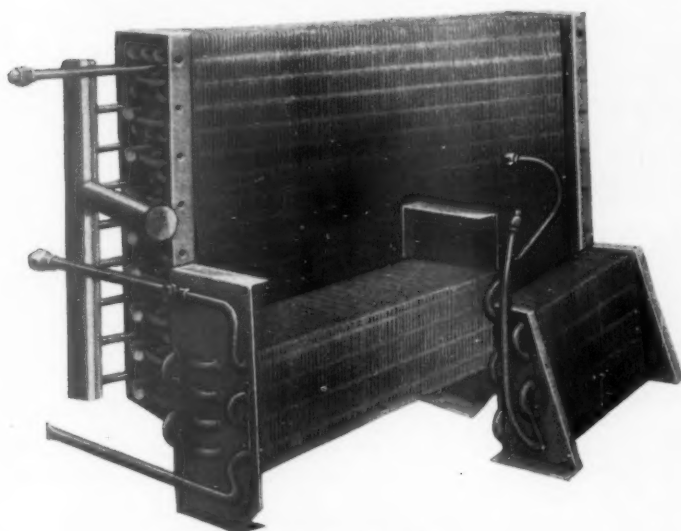


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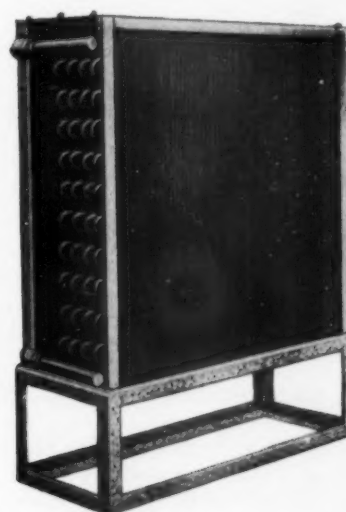


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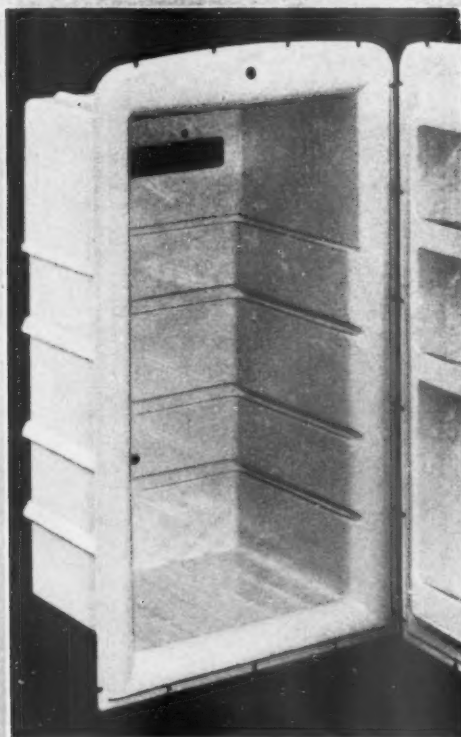
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	0° C	
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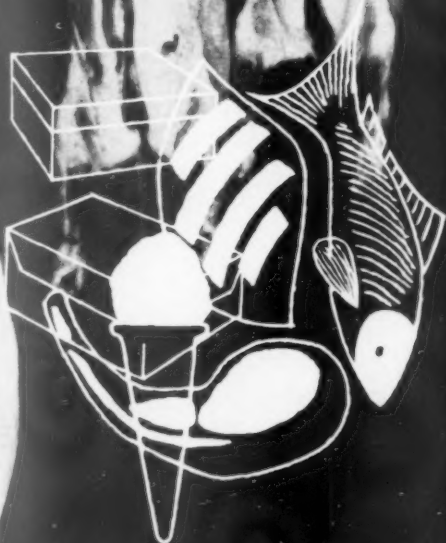
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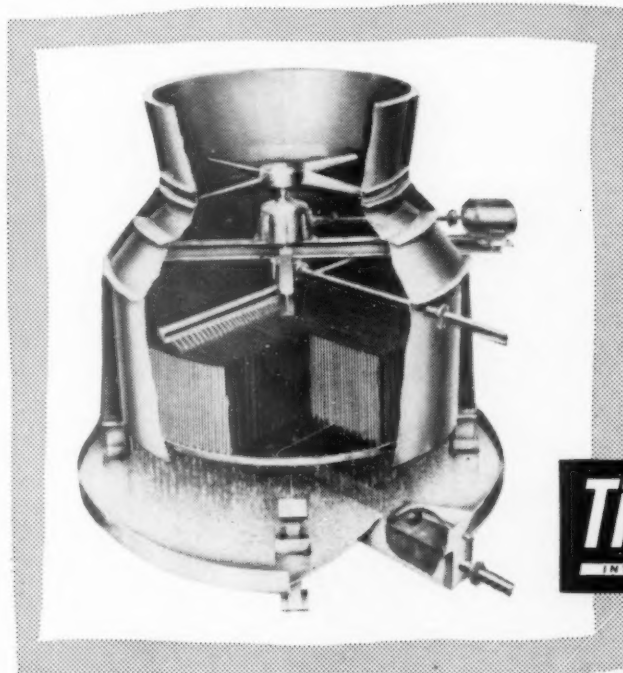


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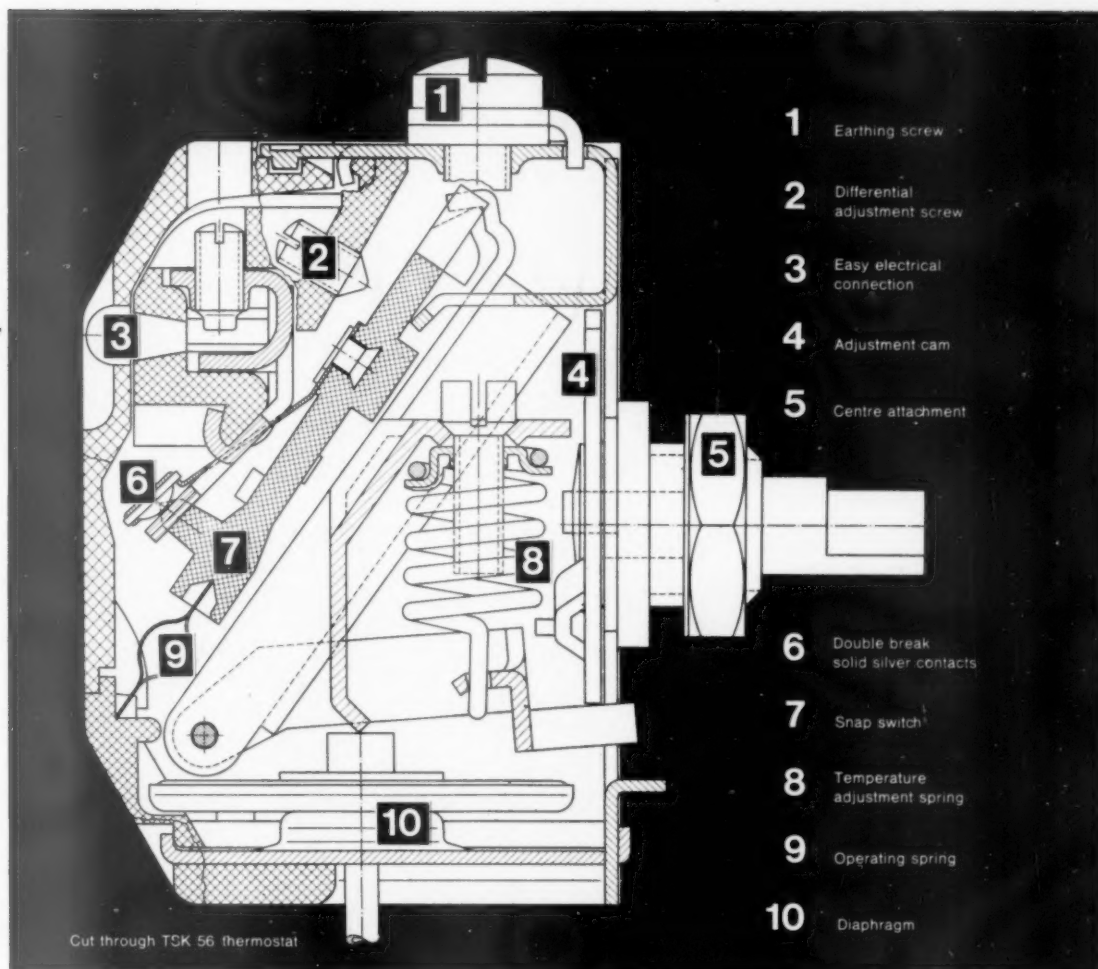
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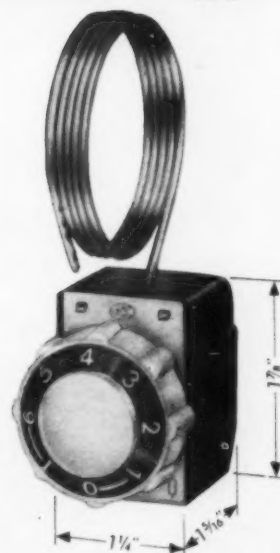
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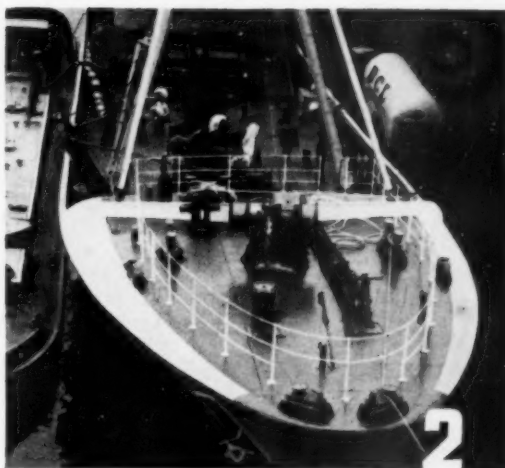
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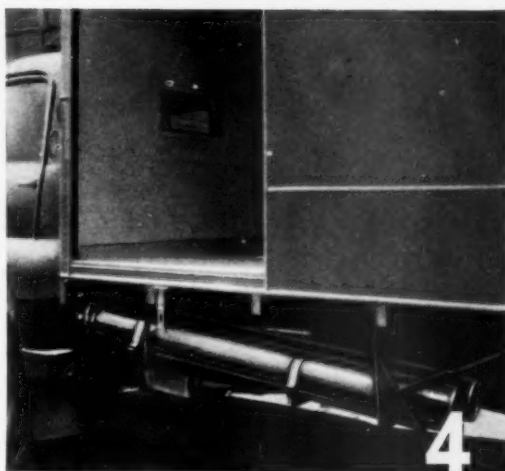
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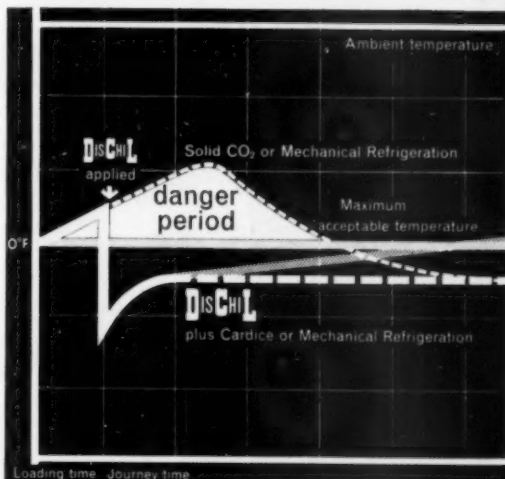
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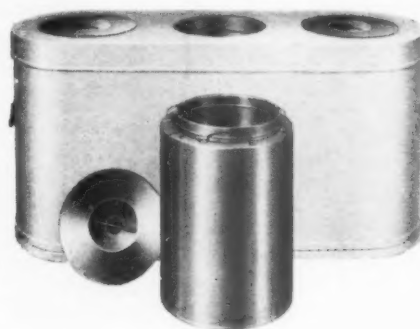
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Editorial...

The B.R.A.'s Annual Meeting

Brighter "Domestic" Outlook

Supermarket Growth

● The B.R.A.'s annual luncheon, staged so successfully at the Connaught Rooms each March, brings together the industry's top businessmen, and some lesser lights, in a happy throng who put aside the competitive approach for a period lasting from aperitifs to cigars—approximately three hours. It affords a perfect opportunity for the industry to tell the Government, in the nicest possible way, of course, what it thinks of some of its actions affecting refrigeration affairs; in turn, the Government spokesman is honoured with the last word. Last month the Minister of State, Board of Trade, and Mr. C. M. Marks both gave good accounts of themselves. The main discussion this year centred on the theme "The Home and Export Markets. Mr. Marks, B.R.A. chairman, said, in effect, that extreme and sudden changes in purchase tax and hire purchase regulations such as they had suffered over the past few years caused violent fluctuations in home demand and therefore caused unhealthy and uneconomic rise in production curves. That inevitably precluded manufacturers from forward planning on the basis of a steady and economic rise in production, thus enabling them to reduce costs and therefore selling prices at home and abroad. The Rt. Hon. F. J. Erroll countered this with the argument that when the demands of the home market became excessive, then our exports, our balance of payments, and our whole economy suffered. At times, therefore, the Government had to impose some restraint in the full knowledge that what they had done would be unpopular and would have awkward side effects.

● Mr. C. M. Marks is to be congratulated on a very successful year of office, during which he has tackled with great tact and patience many difficult problems, not least of which has been the refrigeration exhibition situation. At the annual general meeting of the Association held on the day of the luncheon, Mr. N. F. T. Saunders (Kelvinator Ltd.) was elected chairman and Mr. R. H. Hemmings (York Shipley Ltd.) was elected vice-chairman.

● A brighter outlook in the domestic refrigerator industry is reflected in the return to full-time working by the major companies. Latest to announce this state of affairs is Morphy-Richards (Astral) Ltd., at

their refrigerator factories in Dundee. Mr. W. Roxburgh, managing director, states: "The Morphy-Richards good-value policy has enabled Astral successfully to combat the difficult trading conditions created by the imposition of hire-purchase restrictions last year. This policy of ours will produce an even greater effect on our sales if, as is hoped, the initial h.p. deposit is reduced from 20 per cent. to 10 per cent. in the forthcoming budget." Incidentally, this company has introduced a new 1-6 c.ft. table model to retail at 28 gns. It provides within its 1-6 c.ft. gross storage capacity a three-level shelving area of 3-1 sq. ft. There are two wire shelves and the top shelf is cut away to accommodate tall bottles. Door storage includes an egg-rack and bottle shelf. There are two ice trays for making 24 cubes (1-1 lb. of ice) in the cooling unit, which can store up to 4 lb. of frozen foods. The marketing of this refrigerator at this price is a remarkable achievement when one considers that most prices have quadrupled since 1939; the cheapest refrigerator in that year was priced at 19 gns., if our memory serves us correctly.

● In certain quarters it has been reported that several discount stores are marketing refrigerators and other domestic appliances below manufacturers' list prices. It was stated that a foot-hold in the "cut-price" television and appliance trade has been carved for retail grocers by a section of a large group. At least one large refrigerator manufacturer would like to make it known that *they have not supplied this group* with refrigerators, neither is it their intention to supply this, or any other discount store. This maker's area manager has visited the store mentioned and confirmed that none of their products was available as stated. In the case of another discount store in Leeds, where this maker's models were on offer at below list prices, they have ascertained that these were supplied by a local retailer in Leeds, and steps have been taken to *stop supplies through this source*. In view of the publicity given to the opening of these discount stores and availability of branded products at below list prices, our Swansea friends are asking the trade press to state that it is their policy to support retail price maintenance on current models and not to supply such outlets.

● Some useful information on the growth of supermarkets emerged at a packaging conference organized by P.P.D.A. in London last month. Although supermarkets are springing up all over the country, the main development at present is in London and the home counties with approximately 46 per cent. in London and the south-east, 8 per cent. in the south-west, 6 per cent. in the south, 30 per cent. in the north and 10 per cent. in Scotland and Ireland. The operation of supermarketing is spread between co-operatives 42 per cent., large multiples 45 per cent., small multiples and independents 6 per cent. and department stores 7 per cent.

● With the ever-increasing number of supermarkets and their ever-increasing size, it will be seen that the number of shops in the country is going to diminish

considerably and distribution of meat and vegetables, etc., will take on a new look. There will be less food going through the markets and, in fact, in years to come, there will be a considerable reduction in the number of central markets required, as most fresh produce will be delivered from source direct to the shops. The Association foresees a great revolution in A.F.D. or freeze-drying and both these factors will have to be borne in mind by people who are considering the redevelopment of such markets as Covent Garden. The greatest acceptance by the housewife of any perishable product has been in the field of fresh meat. Most supermarkets average somewhere between 15 per cent. and 20 per cent. of the turnover in the sale of fresh meat and poultry.

● The 1961 Sydney Trade Fair, where Russia has booked nearly 30,000 sq. ft. of space, is virtually sold out. And a second Sydney Trade Fair has already been officially announced for 1963. The first one, largest to be held in the Southern Hemisphere, opens on August 1 and closes on August 12. It will be held on the Royal Agricultural Society's large show-ground on the outskirts of Sydney, where the 1963 trade fair will also be held. Exhibits this year will cover almost every category of consumer and capital goods, ranging from foodstuffs and household goods to precision tools and power equipment. Other countries with national pavilions at the Fair (areas expressed in square feet) include the following: Austria, 3,300; Belgium, 3,200; Ceylon, 1,500; China, 1,000; Czechoslovakia, 5,600; Denmark, 3,300; France, 15,000; Germany (W.), 18,000; Hong Kong, 2,000; India, 3,500; Israel, 1,000; Italy, 20,000; Japan, 10,000; Korea, 400; Netherlands, 3,000; New Zealand, 3,500; Pakistan, 300; Poland, 1,076; Sweden, 2,500; Switzerland, 3,500; U.K., 4,000. What a pathetic figure that "4,000" looks against the U.K. Surely we could have lashed out a bit in the territory of one of our best friends overseas.

● Conditioned air blends with modern décor to create a restful atmosphere in the new cocktail lounge at the White House, Regents Park. Conditioned air is provided by a split package type of air-conditioner manufactured by Carlyle Air-Conditioning and Refrigeration Ltd., London. Vitiating air is extracted from the false ceiling over the bar area. Designed by the architect, Dennis Lennon, M.C., A.R.I.B.A., the lounge is elegantly fitted and overlooks a sunken swimming pool. The air-conditioning system was designed and installed by James Combe & Son Ltd., London.

● By the end of this summer there should be some 500 vans on the road selling soft-freeze ice cream; two years ago there were not a dozen. This month it has been announced that Northern Dairies has bought a substantial interest in Mr. Whippy (Soft Freeze), the company which pioneered the soft ice cream vans in the U.K., largely in order to help the expansion of the company; and it is only a short time since an invasion of the U.K. by Mr. Softee, a

leading U.S. exponent of soft-freeze, was announced. Mr. Whippy plans to expand from 150 to about 350 vans this year, and Mr. Softee, which has the backing of J. Lyons and Co., will run some 150 vans during its initial season. If these vans do all that their proprietors claim for them, they could capture 3 per cent. or more of the total U.K. ice cream market this summer, declares *The Financial Times*.

● Much in the news lately has been the English Electric Lightning—Britain's latest all-weather day or night interceptor. The Lightning can travel at twice the speed of sound; is highly manoeuvrable at all speeds and altitudes and it can land and be brought to rest within 800 yards . . . a distance which at full speed it would cover in little more than one second. There can be no margin for error in the production of a supersonic plane such as the Lightning. Every part must be checked and re-checked. A particular problem in aircraft construction is posed by the fact that strange things happen at high altitudes. One of the main factors concerns temperature and, for this reason, an important item of the equipment used for testing parts of the Lightning was refrigeration equipment supplied by Prestcold. This was able to reproduce the excessively low temperature experienced at an altitude of 60,000 ft. When the prototype was being developed about half the entire aircraft was tested at various times in a specially built cold room. Components such as Perspex canopies were checked for signs of cracking, fuel and hydraulic systems for possible leakage, the functioning of vent valves and pump mechanisms among others was decided in conditions of extreme coldness so that every detail of their reactions could be recorded and appropriate modifications made.

● There are now 540 bulk milk collection tanks in use in Scotland, Mr. G. B. Drape, regional marketing officer of the S.M.M.B., told a dairy farmer conference in Stirling recently. They calculated that 24,250,000 gal., or 13 per cent. of production would be uplifted from bulk tanks during the next year. Some 300 applications were pending, representing an extra 14,500,000 gal. He warned against carelessness and indicated that local authorities would be increasingly critical, and rightly so, on hygienic aspects. Dr. Selwyn Baines, bacteriologist to the West of Scotland College, reported that the bulk tank had permitted substantial advances in cooling and storage of milk and was a major advance in clean milk production. Failures were accounted for to the extent of 67 per cent. by milking machines, 20 per cent. by other dairy equipment, 10 per cent. by coliform infection of the udder, 2 per cent. by faulty byre techniques and 1 per cent. by contaminated water supplies. In the Aberdeen board area, bulk handling is also creating increased interest. Installation of bulk tanks in the Inverurie-Oldmeldrum-Ellon area is nearing completion and the first bulk tanker in the north-east will start operations soon, supplying the Aberdeen and District Milk Marketing Board. Other areas in the north-east are also discussing bulk handling and rapid development is expected.

NEWS OF THE MONTH

Refrigeration and A-c Exports.—During February, 1961, air-conditioning and refrigerating machinery and fans (commercial and industrial sizes) to the value of £916,252 weighing 1,268 tons was exported from the United Kingdom. Comparable figures for February, 1960, were 1,161 tons, worth £764,060.

Exports' Analysis.—Of the 1,268 tons of air-conditioning and refrigerating plant worth £916,252 exported by Great Britain in February—quoted in the preceding paragraph—70 tons went to the Union of South Africa, 18 tons to India, 50 tons to Australia, 60 tons to New Zealand, 58 tons to Canada, 205 tons to "other Commonwealth countries," 89 tons to Eire, 11 tons to Sweden, 157 tons to Western Germany, 75 to the Netherlands, 104 tons to Belgium, 37 tons to France, 6 tons to Italy and 328 tons to "other foreign countries."

Refrigeration Plant Classified.—Of the total exports of air-conditioning and refrigeration machinery during February, commercial refrigerating machinery accounted for 339 tons worth £183,218, industrial plant and equipment for 256 tons worth £152,952, and refrigerating machinery, equipment and parts for 429 tons worth £361,331.

Exports of Small Refrigerators.—During February, 1,091 tons of complete refrigerators and domestic refrigeration equipment were sent overseas from Great Britain. These exports were worth £708,840. The 1,091 tons comprised 34 tons to the Union of South Africa, 3 tons to Rhodesia and Nyasaland, 47 to New Zealand, 72 tons to Canada, 345 to "other Commonwealth countries and Eire," 26 tons to Sweden, 54 tons to Western Germany, 15 tons to Italy and 495 tons to "other foreign countries."

Blue Band Campaign. Four leading refrigerator manufacturers are endorsing this year's Blue Band luxury margarine advertising and sales campaigns. They are A.E.I.-Hotpoint, Electrolux, Frigidaire and Prestcold. Blue Band spreads at a

very low temperature, even when taken straight from the refrigerator. Advertisements in the national Press, leading women's weeklies and on all major T.V. channels feature a refrigerator from one of the supporting manufacturers emphasizing this fact. At the same time, the advertisements display the separately wrapped 1-lb. packets in the 1-lb. pack. A series of national and regional competitions are to be held with refrigerators as the main prize. Point-of-sale material and leaflets will also feature this co-ordinated campaign.

last month the completion of a package deal with the Norge Division of Borg-Warner. Last year Kenwood completed an agreement with Borg-Warner to import their refrigerators into Britain. Now the Norge Division have decided to include the new Kenwood refrigerator and home freezer in their range for sale throughout the United States and other markets.

A new Conveyancer fork lift truck with a Perkins diesel engine will be among the industrial equipment shown to the Russians at the

A fleet of Lyons Maid refrigerated vehicles built by Mann, Egerton & Co. Ltd.



LEC'S FIVE-DAY WEEK

Lec Refrigeration Ltd., of Bognor Regis, Sussex, returned to a five-day working week last month. 30 per cent. of Lec employees are back on a full 45-hour week and this figure will be increased to 80 per cent. by the end of this week. Restitution of normal working hours will follow for the rest of Lec employees and it is expected this will be put into effect within a fortnight. The move follows the easing of credit restrictions by the Government which announced that hire purchase payments would be extended from two to three years. The company said that the effect of this announcement was felt immediately and trade has improved considerably.

Mr. Kenneth Wood, managing director of **Kenwood Manufacturing (Woking) Ltd.**, announced on his return from America and Canada

British Trade Fair in Moscow from May 19 to June 4. Conveyancer Fork Trucks Ltd., of Warrington, are planning to exhibit a TC6-24 series V truck fitted with a four cylinder Perkins Four 192 diesel engine, developing 58 b.h.p. at 2,400 r.p.m. It has a 6,000 lb. capacity at 24 inch load centre. A feature of the Conveyancer fork truck is the torque converter drive, a fluid transmission eliminating clutch and gear change, and simplifying driver control. A new type of unit construction transmission is used, enabling the main sections to be removed separately, and absence of a propeller shaft enables the Perkins diesel engine to be installed low in the chassis giving a lower centre of gravity and more stability. Power developed by the engine is transferred to the driving axle by the vortex circulation of oil between an engine driven impeller and a turbine.

Air-Conditioned Headquarters for Birds Eye

BIRDS EYE FOODS LIMITED, whose very existence is so closely linked to the refrigeration art, are having built for themselves new office headquarters at Walton-on-Thames, Surrey, which will provide fully air-conditioned surroundings. Thus, controlled conditions of temperature and humidity will be maintained throughout the year.

Last month, representatives from Birds Eye, Higgs and Hill, Sir John Burnet, Tait and Partners, architects, and Matthew Hall and Co. Ltd., mechanical engineers, met on the site at Walton, when Mr. K. J. B. Webb, Birds Eye's marketing director, disclosed details of the building modelled below.

The building is to house the headquarters and staff of about 600 and will provide 110,000 sq. ft. of floor area comprising office accommodation, with a staff lounge and dining-hall, snack bar and private dining-rooms. A tea servery will be provided on each floor.

The structure, which is planned on a 5 ft. 3 in.

module, will be on ground, first and second floors, with plant and storage in the basement and three further plant rooms on roof. It will be approximately 318 ft. long by 170 ft. deep, with two internal garden courts.

The building will be fully air-conditioned by a high velocity induction air-conditioning system to provide controlled temperature and humidity throughout the year. Separate extract systems will be installed for the kitchens and lavatories. The main system is designed to provide a temperature of 68° F. in winter conditions and up to 10° of cooling in the summer. The air is introduced through special induction units below each window and withdrawn through the suspended ceilings for partial recirculation.

The number of induction units will be in the order of 750 arranged between each module. Chilled water will be provided by a centrifugal hermetic compressor using R11 (trichloromonofluoromethane) CClF having a heat extraction of 350 tons of refrigeration. This 4,200,000 B.t.u./hr. cooling/heating system will be pneumatically controlled by compensated solar thermostats situated on the building frame. Cold and hot air will be supplied at high pressure and high velocity through circular conduits.

Windows exposed to the sun will be protected with vertical louvred plastic blinds.

Picture of the Month

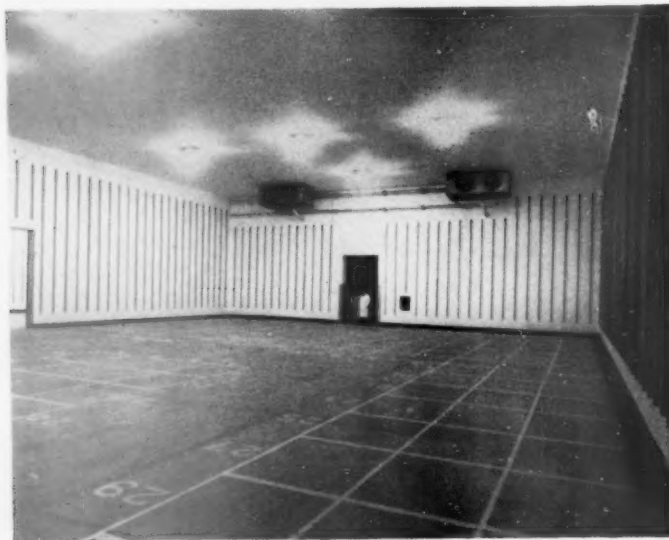




Hull's Latest Public Sub-Zero Store

ONE of the latest and largest warehousing and cold storage companies in Hull, William Gil-yott & Co. Ltd., have recently opened a large sub-zero cold store of 120,000 cu. ft. capacity, capable of maintaining a temperature of -20° F. The store, situated in Stoneferry, is conveniently accessible to both the Commercial and Fish Docks in Hull.

Built on brick sleeper walls on which are Bison precast concrete beams at 4 ft. 0 in. from ground level, corresponding to the height of the loading bay, the store is of steel framed construction without pillars or supporting beams inside. Access to the store is provided by a covered-in loading bay which has accommodation for six vehicles at a time, behind which are offices and checkers' accommodation. The fascia



The larger of the two chambers is of 85,000 c.ft. capacity.

The unusual height of these chambers is clearly seen in these illustrations. Cooling is by specially designed finned coil coolers.



of the store at the loading bay is of attractive cedar wood construction, and the remainder of the store, polished aluminium,

The refrigeration plant, supplied to Lloyds Survey classification requirements, consists of two 3MAC compound ammonia compressors fitted with 60 h.p. slip ring motors supplied by Messrs. Compton Parkinson, two forced draught evaporative condensers, and Worthington-Simpson rotary liquid ammonia pumps, all of which are operated by a multi-motor automatic control panel. Six specially designed, ceiling suspended finned coil coolers are provided, housed in galvanized steel casings each with 30 in. diameter fans. Provision has been made for hot gas defrosting of the coolers, with electrically heated drip trays.

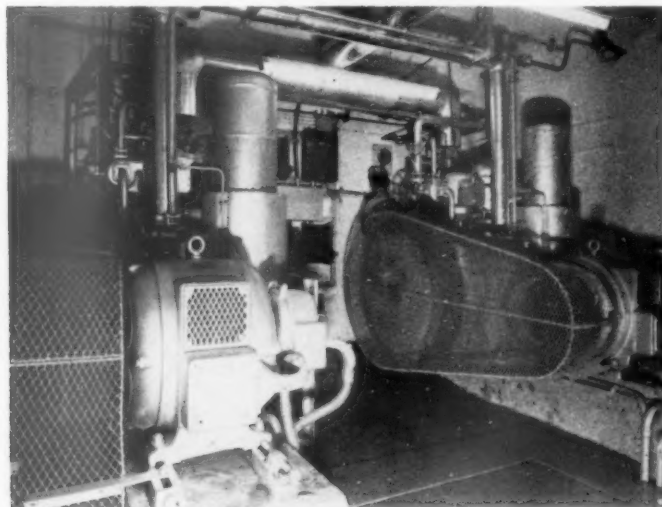
Arrangements are now in hand for facilities to enable fish, vegetables or other commodities to be

frozen in a horizontal multi-plate freezer, which will be available for the use of clients.

Messrs. Wm. Gilyott have some 20,000 tons warehouse capacity for dry goods, and 1,000 ft. of wharfage on the River Hull, together with 38 river craft.

At their High Street premises, a public cold store of 1,000 tons capacity, constructed in 1926, caters for the wholesale meat and butter trade. This building, one of the few to survive the 1941 air raids in this locality, has refrigerating plant supplied by the same manufacturer. The compressors, installed thirty-four years ago, in daily use, have six of the original cylinders fitted, still to Lloyds Survey requirements—a compliment to pre-war engineering.

Principal contractors were Messrs. Smiths Insulations Limited, and Messrs. Sterne and Company Limited.



The two, compound, ammonia compressors.

B.R.A.'s VAST GATHERING

Minister of State, Board of Trade, addresses Association

CLOSE on 600 persons sat down to the annual luncheon of the British Refrigeration Association in the Grand Hall of the Connaught Rooms, London, last month, under the chairmanship of Mr. Cecil M. Marks, managing director, Hussmann British Refrigeration Ltd.

The guest of honour at this great assembly was The Rt. Hon. F. J. Erroll, P.C., M.P., Minister of State, Board of Trade. Every major "user organization" was represented by its president or secretary on the top table.

In his opening remarks, Mr. Marks stated: "I will try to tell you of one or two of the many items which the B.R.A. council has endeavoured to cope with in the interests of the industry during the course of the year."

"Some of you may recall that this time last year we were faced with a problem in respect of exhibitions, in that although until 1960 there had never been any sort of refrigeration exhibition as such in this country, we were suddenly faced with the prospect of two such exhibitions, both scheduled to be held in 1961 and organized by different parties. This was obviously undesirable and therefore the council endeavoured to get the parties together to try to arrange an amicable settlement."



Cecil M. Marks, chairman, B.R.A., and T. Whittaker, director, B.R.A.



From right to left: The Rt. Hon. F. J. Erroll, N. F. T. Saunders, R. Reynolds and A. Hunking.

"Regrettably, they were not entirely successful in this endeavour, but they did manage to persuade one of the organizers to withdraw. At the Association's A.G.M. last year it was agreed by a majority that once every two years would be the ideal interval at which to hold such an exhibition in this country and consequently, in order to try to avoid any future confusion of a like nature, the Association itself decided to sponsor an exhibition representing the whole industry, of



From right to left: E. M. Heap, W. R. Sinclair, J. Douglas, Kenneth Lightfoot, and H. C. Timewell.



Above: G. E. Worssam and D. S. Carruthers.

Right: Dr. D. R. Scott, E. Burman, Dr. J. E. Garside and E. G. Rowledge.



Below: D. A. Welch, N. F. T. Saunders and Kenneth Lightfoot.

an international nature, in 1962. A strong committee has been formed, of which, possibly, the only weakness which could be found lies in the fact that I am chairman, professional organizers have been engaged, the Grand Hall at Olympia has been booked and the International Refrigeration Fair, fully representative of all aspects of the industry and of all types of suppliers to the industry, will be held there from April 12 to 18, 1962.

"On quite a different tack, a number of meetings have taken place with the frozen food interests. As some of you will have noticed over the past few years, various sections of the frozen food industry have been what we think unduly critical of the refrigeration industry's outlook



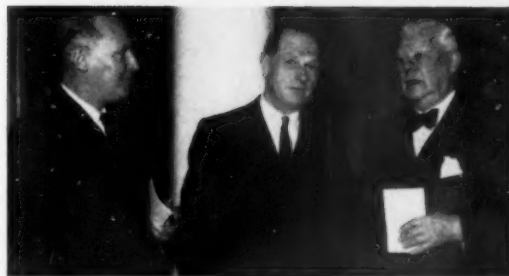
Left: J. S. Wilson, F. L. Pettman, and W. R. Kern.

and attitude towards their problems and their growth. Public expressions of such an opinion have not been lacking over the past few years and obviously, such a state of affairs between two industries so very much interdependent was to be deprecated.

"We have had a number of meetings with the representatives of the three bodies making up the frozen food

interests, that is to say, the producers and processors, the wholesale distributors and the food manufacturers, as a result of which we now have a much better understanding of each others' needs, problems and difficulties and have agreed on a common policy and common aims, towards which we shall jointly work over the next few years.

"Our relationship with kindred trade associations has been good and I might even say, cordial. This could even apply to the British Electrical and Allied Manufacturers' Association, to whom last year's chairman 'beamed' a passing reference. This body, as you know, embraces in its orbit in some form or another, nearly the whole of the many branches of the electrical industry and quite understandably, during the year, in order to service some of its members entering for the first time the domestic



refrigeration field, has felt constrained to start a refrigeration section. This naturally caused us some concern and might have precipitated a clash, but as a result of various meetings with the chairman of B.E.A.M.A., the chairman of the refrigeration section and the director of B.E.A.M.A., of whom the latter two we are pleased could join us to-day, I am happy to say that we have their assurance of a desire for fullest possible co-operation and working together, with no intent to deprive this Association of any part of its right, proper and essential place in the scheme of things, which is to serve the specialized refrigeration industry as a whole—an object which is not part of the aims of the British Electrical and Allied Manufacturers' Association.

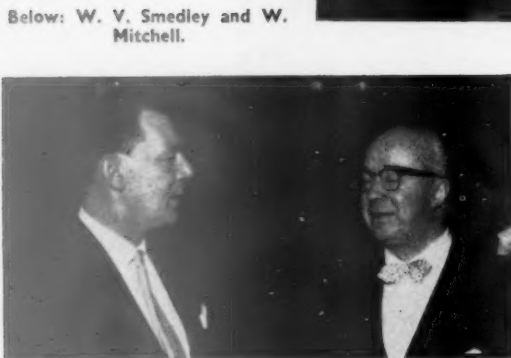
"We have, of course, co-operated closely with the National College which, as many of you know, has been rebuilt and we have set aside our usual sum towards work



Above: A. C. Murdoch, F. C. Poulter and S. S. Sherlock.



Left: A. H. Fuller, W. Creemer, and J. T. Herbert.



Below: W. V. Smedley and W. Mitchell.

"Therefore, in order to protect the buying public as much as to safeguard the good name of our industry, we approached the Government Department concerned and asked for a marking order to be imposed in order to make it quite clear that such refrigerators were of foreign manufacture.

"A properly prepared case had, of course, to be made out for this and the correct representations made and I am happy to say that as a result of this having been accomplished, it appears that the Government Department agree with us and such an order may come into force in the not too distant future.

"I am sorry to say that in other respects, we have not

found the Government, in the form either of the Treasury or the Board of Trade, quite so co-operative and understanding of our problems. Since the war, after which this industry seriously began to get under way in this country, getting on for £450,000,000 worth of refrigeration—industrial, marine, commercial and domestic—has been produced, of which not far short of 40 per cent. or £180,000,000 worth has been exported. Not a bad record for an industry which was not indigenous to this country and which at one time was thought by some people even to be alien to it. The biggest proportion and the fastest growing side of the industry is the domestic refrigerator of which, during the years mentioned, something like £230,000,000 worth has been produced and £100,000,000

on refrigeration research in the form of a scholarship at the college.

"We have also continued our co-operation with the European refrigeration body which is growing in size, influence and importance and we have, in fact, increased numerically our representation so that we can adequately be represented at more of the standing committees. It may be of interest to note that one of the meetings of this body took place in London early last year and this enabled many more of our Council members to be present at the various committee meetings.

"This international co-operation, of course, is all right fostered in its proper place, but sometimes it can go too far. Such a state of affairs did arise during the year in regard to the number of domestic refrigerators and display cases which were imported into this country, owing no allegiance to any British standard or, in fact, to any standard recognized in this country, in that the tolerances which are apparently permissible as between claims made for them and the actual size and performance are out of this world as far as we are concerned.



W. Nicoll, W. S. Stevenson, J. A. Walker, G. L. Cheetham, E. N. Davies, E. W. Rouse and D. C. Holden.

worth, or 44 per cent., exported. One would imagine that successive Governments, so dependent upon exports to preserve the balance of payments, would try to understand and to foster such a new and potentially worth while infant. This does not appear to be the case and during the whole period of its growth and expansion, we have been

bedevilled by the imposition, relaxation, re-imposition, annihilation, and superimposition of hire purchase restrictions, credit restrictions and purchase tax.

"I myself was present amongst the audience at Church House in July last when the Prime Minister inaugurated the Government's special appeal to industry to step up exports and do everything in their power to find new markets, to encourage fresh exporters who in addition to helping the country, like themselves benefit both financially and in the joy of the experience.

"We do not pretend to be as intimate or knowledgeable of the details which go to make up the over-all picture as the members of the Government and their advisers. We realize that what benefits the over-all whole may hinder some of the parts thereof. We find it difficult to understand why we must always be one of the parts which are hindered, more especially when, as I have known, we have made such a worth while contribution and are still able to do so.

Sudden H.P. Changes Unhealthy

"If one accepts the time-honoured and proven approach, then it is an irrefutable fact that extreme and sudden changes in purchase tax and hire purchase regulations such as we have suffered over the past few years cause violent fluctuations in home demand and therefore cause unhealthy and uneconomic rise in production curves. This inevitably precludes manufacturers from forward planning on the basis of a steady and economic rise in production, thus enabling them to reduce costs and therefore selling prices at home and abroad.

"This, as I have said, is the orthodox and proven approach. I am, however, well aware that there are certain theorists at the Board of Trade who hold that the view "A healthy home market is essential to a good export market" is outmoded and outworn and think that we should gear our production to the export market, allowing home trade to follow or not to follow in its wake.

"It may well be that the circumstances are such that we should consider seriously a new and different approach from that which has stood this industry and the country in such good stead in the past. We are indeed more than prepared to do this, but I should like to make it clear that in my opinion, the general theory of gearing production entirely to export is no ready-made panacea for all ills, in that export markets themselves vary considerably one from the other and possibly the highest common factor is still our own home market.

"Nonetheless, whatever the problems, whatever the difficulties, we are willing and anxious—and, indeed, able—to play our part if we are given the opportunity for full discussion with an appropriate and proper understanding of the intricacies and problems of our industry.

"I would, therefore, entreat the Government not just to regard us as part of the F.B.I. or some by-product of, say, the motor car industry, but to consider us as a young but fully-grown specialized industry which has already delivered the goods and is able to deliver a lot more if properly treated and consulted."

Replying on behalf of "The Guests," **The Rt. Hon. Frederick Erroll** declared: "In 1960, our exports of domestic refrigerators were about 15 per cent. higher than they were in 1959. You will perhaps not think me chilling if I interpose here the reminder that even so our exports of domestic refrigerators in 1960 were a good bit less than what they were in 1958 and 1957. 1960 also saw an increase in our exports of commercial refrigeration equipment. These better export results are an encouraging response to the Government's call for a really big export effort from the whole of British industry.

Vigorous Export Trade Vital

"You have represented to us forcefully that yours is an export industry with a strong growth potential, but that your exporting power is damaged by any restrictions imposed on the development of your home market. It is true that a large and steady home market helps to reduce overheads, and hence selling prices, but without a vigorous export trade we just cannot have a steady home market. As barriers to world trade are reduced, the distinction between the home market and the export market is growing steadily less, and there is already ample evidence of flourishing export industries which have hardly any home market.

"We took it as our task to create at home conditions of price stability, a high level of employment, and a rising standard of living for our people. We cannot control all the factors which play upon our economy. If you take two economists and rub them together, the sparks will fly; but one conclusion which it is impossible to avoid is that when the demands of the home market become excessive, then our exports, our balance of payments, and our whole economy suffers. At times, therefore, we have to impose some restraint in the full knowledge that what we have done will be unpopular and will have awkward side effects.

"What we always come back to is that we must so regulate our affairs that we earn enough to pay for our food and the raw materials which we have to import. This, including fuel, accounts for about four-fifths of our total import bill. Part of the rest is finished or semi-finished goods for industry, and another small part is consumer goods.

Large Imports in 1959

"I do not need to tell you that in 1959 and in 1960 our imports of domestic refrigerators were very large in comparison with what they had been previously. It has been suggested that we ought to cut down our imports of some of these so-called inessential consumer goods, but we cannot expect other countries to continue to let in our products, if we shut theirs out. There is no hope for economic expansion if we slip back into trade restrictions, and Britain depends more heavily on exports of the widest possible range of manufactures than any other nation.

"Once we have paid our import bill, we still need to earn more through our exports to pay our debts, and to continue to play our large part in helping the under-developed countries to improve the living standards of their people, and to increase the volume of world trade.

"When aircraft leave the sound barrier far behind, and go towards the heat barrier, they are dependent upon the refrigeration equipment which you supply. Some computers which get through problems of incredible complexity with unbelievable speed would collapse with their equivalent of brain-fever, if you did not provide the modern version of ice-packs. And equipment which you have designed gives doctors the means to reduce body temperatures to the state of hypothermia at which they can work miracles of heart surgery."

A trade delegation, jointly sponsored by the Board of Trade and the F.B.I. and organized by the F.B.I. will leave on April 11 to visit seven countries in South-East Asia, under the chairmanship of Sir Edward Thompson. The delegation will work through four simultaneous missions. After tours lasting a fortnight, the entire delegation will meet in Singapore for a two-day conference with H.M. trade representatives accredited to all the countries concerned.

NEW TESCO SUPERMARKET IN SUSSEX

THE second of Tesco Stores' 25 new supermarkets planned for 1961 was opened last month at West Street, Horsham, Sussex. Like the Stoke-on-Trent store opened a fortnight previously and the seven others opened in 1960, it is fully equipped with Frigidaire display and storage refrigeration.

Horsham is the latest to be added to Tesco's chain of more than 370 grocery shops throughout Britain. It has a selling area of 2,600 sq. ft., entirely on self-service lines but with a large staff of assistants to help customers. All perishables are displayed in Frigidaire "Manhattan" cabinets, including fresh meat, which is cut and wrapped on the premises.

The Frigidaire display cases are built into a composite island site which groups all the refrigeration into one prominent area at the head of the store. In order to provide an unbroken, uniform exterior line

for this island, a special adaptation to the "Manhattan" has been designed by Brett Daniels Limited, Frigidaire distributors who supply refrigeration to Tesco.

The island is made up of a series of cases fitted back to back with single cases at each end and by redesigning the sides and glass risers on these end cabinets to match the exterior line of the other cases, the appearance of a vast single refrigerated fixture has been produced. Altogether 64 ft. of refrigerated display has been centralized in this way.

Each side of the island is 24 ft. long, displaying on one side fresh meat at 32°/34° F. and on the other side butter, fats, cheese and cooked meats on three refrigerated tiers at 38°/42° F. One of the 8 ft. end pieces is devoted to poultry, at 24° F., and the other end is a low temperature case for frozen foods.

Frigidaire coldrooms for the storage of provisions, fresh meat and frozen foods, are also installed in the new supermarket.

Other examples of this special Frigidaire composite island site have been supplied by Brett Daniels Limited for the Tesco supermarkets opened recently at Stoke, Fareham and Rickmansworth. Others are being supplied for Tesco at Bristol and Hammer-smith, both of which are to be opened shortly.



Frozen foods occupy one of the specially redesigned Frigidaire "Manhattan" display cases in the latest Tesco supermarket at Horsham, Sussex. The sides of the case are adapted with new glass risers and a slope which matches the adjoining front faces of the remaining cases forming the "island" of the refrigerated display.

Q.F.F. for Film Makers.—With advance information that the epic story of "Lawrence of Arabia" is shortly to be filmed in the Jordanian desert comes the news that the production team, now lining up location scenes before the arrival of the main party, are living almost entirely on frozen foods. Ross Frozen Foods of Grimsby are the main contractors for the initial order

which, obtained against considerable competition, through Messrs. Spinneys Ltd., their Middle East Agents, recently arrived at Aqaba and was despatched to the shooting site by refrigerated vehicle.

* * *

CHANGE OF ADDRESS

Lindsell Dewell & Co. Ltd., refrigeration engineers, announce that

their workshops, stores, warehouses and offices are transferred to new premises at 255, Chase Cross Road, Romford.

* * *

Modern Refrigeration is obtainable from the manager, Maclaren House, 131, Great Suffolk Street, London, S.E.1, at thirty-five shillings per annum post free to any part of the world.

COLD STORAGE AT SELF-SERVICE WHOLESALERS

The latest supply house to be put into operation by Weston's Cash & Carry Ltd., a subsidiary of Associated British Foods Ltd., was opened recently at Renwick Road, Barking, Essex. This is the fifth such building to be opened since January last year, when the first started operating in Edinburgh. This was followed almost immediately by a similar house in Middlesex, followed by Bournemouth. With the exception of Reading all have cold stores for bacon, butter, cheese, etc. The cold store at Barking was designed by York Shipley Ltd. and is similar to both Eastcote and Bournemouth depots which have both been supplied with York equipment. The store comprises two rooms, 1,000 c.ft., and 2,000 c.ft., which occupy an area 22 ft. by 20 ft. They are placed side by side and are approached through a cutting and preparation room 10 ft. by 20 ft. The larger of the two rooms operates at between 38° F. and 42° F., with two ceiling-mounted York forced-draught cooling units coupled to a 1½-h.p. hermetically sealed York condensing unit mounted above the store. The 1,000 c.ft. capacity room has a single cooler coupled to a similar York condensing unit and is designed to operate down to 28° F.

The store was constructed by

Wallington-Jones & Co. Ltd., London. Its concrete walls and roof are insulated with 4-in. polystyrene faced with glazed asbestos sheeting. Its floor was laid 6 in. below the surface and made up level with 4 in. of cork and 2 in. granolithic dust-free concrete. The supply house itself covers a total area of 25,000 sq. ft., one-fifth of which is the reserve area where goods are received and held until required to replenish the display shelves. The wholesaler arrives at one end of the building and takes a trolley which he loads as he passes between the racks. Everything is clearly marked with prices for various quantities, with a note of the retail price giving the wholesaler an immediate idea of the profit to himself. He then pays at a cash desk on his way out.

FRIGIDAIRE IN NEW WAITROSE SUPERMARKET

Frigidaire refrigerated display and storage equipment has been supplied for the new Waitrose Supermarket at Dorking by R. E. A. Bott (Wigmore Street) Ltd. The new store, which opened on Tuesday, March 14, has a floor space of 4,154 sq. ft.

and contains a total of 88 ft. of refrigerated display by Frigidaire.

Most spectacular of the refrigeration is a 24 ft. length of four-tier dairy display cases operating at 38° to 40° F., and there is also a 20 ft. section of frozen food display cabinets at -5° F., with an additional 12 ft. case for ice cream kept at -18° F. The meat section at the rear of the supermarket is provided with a 20 ft. "run" of display cases with service from the rear, the meat being kept at 28° to 32° F., while a separate 12 ft. section holds frozen meat.

There are also three Frigidaire coldrooms for storage of fresh meat, frozen meat and provisions.

"DANISH WEEK" AT BEDFORD

A "Danish Week" organized by Howards Refrigeration Ltd., Frigidaire distributors, in their Bedford showrooms this week (March 14 to 17) in co-operation with the Danish Centre, proved very popular with the trade, local housewives and many senior schoolgirls. The event was run by the two organizations jointly to promote the many Danish food products and the need for them to be kept under efficient refrigeration in the shop and the home.

Throughout the week, cookery demonstrations were given by two demonstrators from the Danish Centre, who showed a variety of their country's dishes, including the famous open sandwiches, using products stored and displayed in the



View of the cold store showing the two York forced-draught cooling units at Weston's.

Frigidaire units. Mr. E. Jordon, of Howards Refrigeration Ltd., spoke on the need for refrigeration. He showed the various Frigidaire display cabinets for the retailer, which included two open-top counter units displaying Danish cheeses, a large counter unit with the many cuts of bacon and a series of glass-fronted display cases for butter and other fats, some for self-service and others in the form of display counters. The new range of Frigidaire "Sheer-Look" domestic refrigerators was also on show.

Large parties of senior girls from Bedford schools attended the demonstration in the mornings and members of the public were admitted in the afternoon. Trade visitors mostly attended in the evenings.

Frigidaire Display Cases for Cheese.—Approximately 130 different varieties of cheese were displayed in a wide range of Frigidaire counters and cabinets at an exhibition from January 31 to February 2 in the Bedford showrooms of Howards Refrigeration Ltd., Frigidaire distributors for that area. The exhibition, was organized by Howards in conjunction with Crowson & Son Ltd., of Farringdon Road, London, E.C.1. Messrs. Crowson had supplied home produced and Continental cheeses of virtually every type, displayed according to their nationality under appropriate Frigidaire refrigeration at 40° to 50° F. English and Welsh cheeses were displayed in a large refrigerated counter top fixture, while smaller counter top

units accommodated the Italian varieties and a selection from Holland and Norway. The famous Swiss cheeses had a neat display to themselves in a three-tier refrigerated display cabinet, while French varieties were shown under the gleaming curved glass front of a refrigerated counter. A self-service cabinet accommodated Danish cheese and a further selection of English varieties was shown in a counter display unit. As a complementary display to the cheese, cooked meats, hams and pies were shown in two glass-fronted counters, while frozen foods were shown in an island-sited Frigidaire "Talisman" self-service case. Visitors were able to taste some of the less familiar cheeses.

N. London Refrigeration Show



Frostaire Refrigeration Co. Ltd. held their annual exhibition at "Refrigeration House," Muswell Hill, last month. A large number of refrigeration cabinets were on show, including the full range available in glass-fronted models, together with various types of multi-deck display and streamlined runs of self-service cabinets.

Frostaire introduced several of

their own new lines, in particular a three-quarters vision counter. This counter is made of steel with high-gloss white finish and formica top, or, if desired, a marble top can be supplied. The counter is refrigerated by a completely hermetic-sealed system; a 5-ft. fluorescent tube is fixed behind the refrigerated display sign, and two full-length sliding doors are incorporated. Shelf area

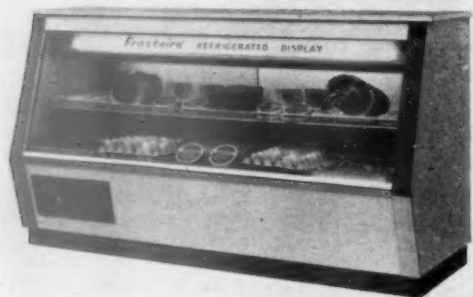
is approximately 24 sq. ft. and the counter is available in 4-ft., 6-ft. and 8-ft. lengths.

Also on display was the new Frostaire frozen food cabinet which has a capacity of 12 c.ft. and is 6 ft. in length. Quadruple glass is embodied with a heater strip to prevent condensation and a temperature of zero at the top is assured by the incorporation of coiling beneath the wide shelf at the rear of the cabinet top. These cabinets are refrigerated with hermetic-sealed units and are available in various pastel shades. They can easily be converted to cascade type with chiller shelf above.

Amongst models on show were



Right: The New Frostaire de-luxe glass-fronted frozen food cabinet.



Left: Chiller temperature display case.

the range of Swedish models including the new IWO Fry's model "Master 100." The Lec range of refrigerators was represented by their dual-purpose model S.18, their GSD71 and GSD91 glass-fronted models. Several Eldwood models were shown as well as some Fairways Insulation Co. models, especially their 4-ft. and 6-ft. glass-fronted frozen-food models.

Refrigeration and Catering Exhibition in North Devon



A REFRIGERATION and Catering Exhibition, was held at The Queens Hall, Barnstaple, last month. This show was presented by the combined refrigeration and catering companies of Messrs. W. J. Allsop & Son, Ltd., and incorporated, in its exhibits, the following companies:— The Prestcold Division of The Pressed Steel Co. Ltd., The Minimax Ltd. (Catering Equipment Division), The Dishmaster (London) Ltd., and The Kenwood Manufacturing (Woking) Ltd., Valentine Equipment Ltd., Peerless and Ericsson, Graham Stewart Ltd., The Imperial Machine Co., and The G. A. Smith Co., (Desborough) Ltd., while amongst other exhibitors were: Fredrick Sage & Co. Ltd., Birds Eye Foods Ltd., and The Eldorado Ice Cream Co. Ltd.

The refrigeration section was divided into five groups. The frozen food group included in its display two of the latest 1961 models, The New Promoter, and the Retailer Major, a follow-up on the OFC.354 a model which has proved popular with small grocers. In support of these models the popular Farm and Vertical Freezers took a prominent position as did the CC.501 and CC.132 Conservators, which concluded the range of frozen food models.

Another sphere in which refrigeration is essential, is the licensed victualler's, who constantly calls on the aids of refrigeration for cooling beverages and for ice-making. In the latter case Prestcold have the answer in the form of a completely automatic ice cube maker which can produce over 1,600 ice cubes per day. In bottle cooling two ideas were on display, the first was of cabinet type storage, while the second was of open type shelving which is usually constructed specially to suit the customer's site, and is therefore ideal for undercounter, or back fittings of bars etc.

Prestcold have recently announced the "Packaway" domestic range of cabinets which were a prominent exhibit in the Barnstaple Exhibition. These three models of 3, 5, and 8 cu. ft. presented as the "Pack-

away" design has won The Design of the Year Award from the council of Industrial Design, and the Duke of Edinburgh's Prize for Elegant Design. To conclude the domestic range were the T.901 de luxe 9 cu. ft. cabinet, and the HF.51 home freezer.

In the larger capacity class of cabinets were the service cabinet range, from Prestcold. This new cabinet of 20 cu. ft. occupied approximately the same space as last years 17 cu. ft. model, and is substantially cheaper. In the lower cubic capacity class of service cabinets the SC.141 model of 14 cu. ft. was retained for 1961.

Finally, the refrigerated display cabinets. Prominent in the exhibition were four of the most popular of Prestcold's varied range of display cabinets, with the "Nuvison" a medium temperature display counter foremost. Also on show were a de luxe version of Farmoor frozen food display counter, the 3-view Stancold display counter, and the Golden Hind 8 ft. display counter.

To conclude the refrigeration section was one of the latest soft ice cream freezers costing over £550 specially imported from Sweden.

R.S.A.'s SUCCESSFUL PARTY

AN informal cocktail party for refrigeration service managers in the London area was held by The Refrigeration Servicemen's Association on the 9th ultimo at the Rembrandt Hotel, London.

Guests were received by Mr. James Douglas, director, L. Sterne & Co. Ltd., president, and Lieut.-Commander M. B. F. Ranken, J. & E. Hall Ltd., chairman. Mr. L. E. Steggel, Lightfoot Refrigeration Co. Ltd., honorary secretary, was on hand.

Mr. Douglas expressed his pleasure at being connected with this field and felt that good foundations had been laid for a worthwhile body. Commander Ranken dealt with the Association's educational aims stating that a modified City and Guilds course would probably best suit their needs. Mr. Owen reported that 20 persons had signed on for the Correspondence Course which leads up to a R.S.A. Certificate.

EAST ANGLIA REFRIGERATION ASSOCIATION

THE first lecture-evening put on by the East Anglia Refrigeration Association was held at St. Andrews, Norwich, on the 15th ultimo. The meeting was very well attended by approximately 70 members of the newly formed association.

Mr. V. S. Meadows, chairman, very warmly welcomed Engineer-Commander W. R. Sinclair, R.A.N., B.ENG., the president of the Institute of Refrigeration, and Mr. D. T. Lee, secretary of the Institute of Refrigeration, and said that the new Association was honoured to have such distinguished visitors. He informed the meeting that at a previous executive committee meeting held in Norwich both these gentlemen had been unanimously elected honorary members of the new Association. He also welcomed Mr. L. R. Meyer, a member of the Institute of Refrigeration, Mr. Collins of William Douglas & Sons. Among those who attended were members of the executive committee, vice-chairman Mr. G. F. Leech, secretary Mr. R. Fiske, Messrs. D. Wilson, S. Meyer, R. Dale, W. Leggett, R. Adams.

A very interesting lecture was given by Mr. Ken Ward, project engineer for Vickers-Armstrongs Ltd., whose subject was accelerated freeze-drying. His lecture was illustrated by slides and a number of very excellent samples of the freeze-dried material. Some of these were sampled by members and found to be excellent in quality. Mr. Ward dealt with the various methods used in the accelerated freeze drying process and also discussed the economics. He also said that there was obviously a potential market for this material in undeveloped countries where cold storage facilities were non-existent and, of course, the tremendous decrease in weight of the material after freeze-drying was an important advantage from the transport point of view and particularly interesting was the fact that the housewife is able to store these for quite long periods in ordinary ambient temperatures.

Afterwards a lively discussion took place and Mr. Ward was fairly bombarded with questions, headed by Commander Sinclair. Questions were asked about vacuum techniques, other methods of

applying heat to the product, the length of time required to reconstitute the product and about whether the method of pre-freezing affected the finished product.

Before the meeting closed, Mr. Ward was thanked very warmly for his very interesting lecture and for coping exceedingly well with the numerous questions and discussion, which lasted longer than the lecture itself.

NEW TESTING UNIT

QUALITY control and testing time are claimed to be greatly reduced with the new Space-Saver testing unit manufactured by Alpha Electric Refrigeration, engineers and manufacturers of refrigeration equipment with over 25 years' experience, of Detroit, U.S.A.

The Space-Saver is composed of a roll-about type chassis cart and three separate, self-contained cabinets; high/low temperature, humidity, and high heat temperature. Cabinets are available with either mechanical refrigeration or liquid CO₂. Removable for use on or off of the cart, the cabinets allow three individual testing procedures to be conducted at the same time. This eliminates time usually lost waiting for test facilities.



Movable testing unit used in the U.S.A.

Cabinet drawers are equipped with work platforms and are interchangeable for crash testing purposes. The cabinets are 24 by 22 by 22 in. with 12 by 12 by 12 in. work areas in Heliarc welded stainless steel. Both the cart and cabinets are finished in grey hammerstone.

As the unit can be moved from department to department uniform testing is ensured.

Testing above and beyond military specifications MIL E 5272 C, it is suitable for testing of electronic components, instruments and hundreds of industrial and research projects.

New Freeze Drying Process. According to a report from the board's technological station at Grande Riviere in Gaspé, Quebec, where scientists have been experimenting in vacuum freeze drying of cod steaks and fillets, cod of tomorrow may be processed in a radically new manner. So far its successful use in the laboratory has

been limited to drying fish slices of 1/4-in. thickness. After being cut into steaks, fillets or portions of this thickness, the fish was dried for 10 hours in a vacuum at 80° F. The finished product was, according to the laboratory report, white porous and of good appearance. It could be warehoused and distributed as readily as any other

frozen fish. It only had to be soaked in water for five minutes to give the appearance and texture of fresh fish. Similar experiments are planned for this year, using spiked plate drying and radiant heating, and comparing the results with the other methods. Experiments will also be conducted with salt fish.

REFRIGERATION FOLLIES

—No. 4

(Overheard at the
Ideal Home Exhibition.)



"All I wanted was one that
stands on the floor and
clutters up the kitchen."



MORPHY-RICHARDS' BOARD

This photograph shows the reconstituted board of Morphy-Richards Limited meeting at the Morphy-Richards headquarters in Conduit Street, London, W.1. On the right of the picture is Sir Joseph Lockwood, presiding as chairman. Sitting round the table, reading from Sir Joseph's right are Mr. J. E. Wall, O.B.E., Mr. H. W. Griffiths, Mr. Z. Weyde, Mr. W. Roxburgh (managing director), Mr. D. W. Morphy and Mr. J. R. Ingoldby (secretary).

AUSTRALIAN HEAVY REFRIGERATED TRANSPORT

Australia's first Trailmobile insulated Hi-Cube van fitted with Perkins-engined Transicold refrigerated equipment seen leaving Red-Hill, Victoria, on the start of a 1,300-mile journey to Brisbane with 15 tons of perishable goods.



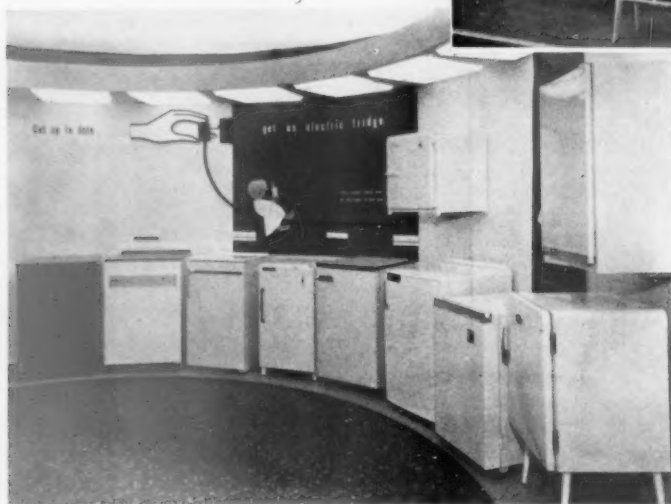
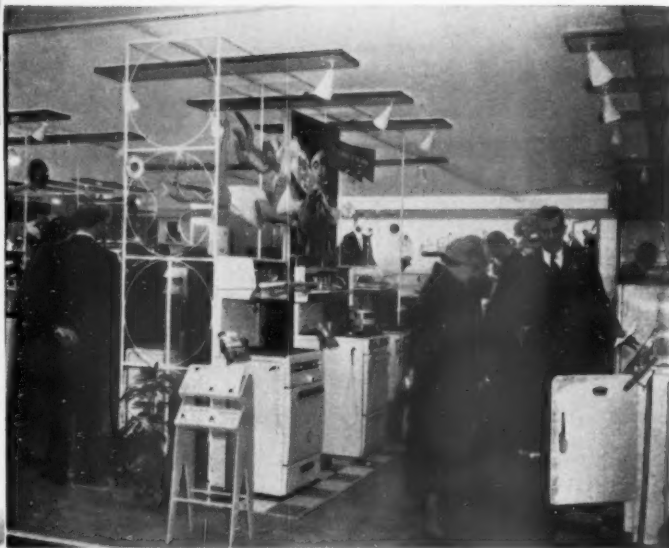


Two popular recording stars—Adam Faith and Connie Francis—study a leaflet on a gas refrigerator they have just looked at on the Gas Pavilion. "Top Ten" appliances are cleverly linked with "Pop" records as the theme of this stand, which is being visited by some of the popular recording stars during the run of the exhibition. At the Gas Pavilion visitors examine the latest home equipment which is attractively displayed in a novel setting.

"IDEAL" REFRIGERATORS



Galaxy of new and improved models at Olympia



THOSE looking for a new refrigerator must have been dazzled by the wide range of excellent models featured prominently at this year's Ideal Home Exhibition at Olympia. There were models of all shapes and sizes to suit everyone's taste and budget, for the kitchen and, with the Tricity "diner-cold" model, the dining-room or lounge. Most of the bigger well-established firms were showing the models seen at previews during the week prior to the exhibition, and described in last month's issue.

Very impressive was the Kenwood stand where their twin refrigerator and freezer came in for a great deal of admiration. This is an imaginative attempt to interest the housewife in deep-freeze; the cabinets stand side by side,

The Electrical Development Association's stand at Olympia.



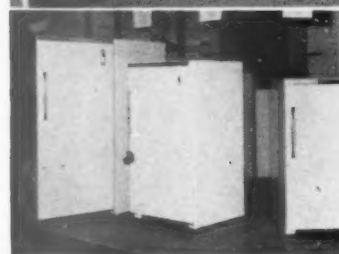
◀ H.M.V.



◀ Bendix



◀ Lec



◀ Kelvinator

or if desired may be placed one above the other. The deep-freeze holds well over a one cwt. of frozen food. The freezer may be covered with a table top so that it will fit, so the makers claim, into a 10 ft. by 8 ft. kitchen.

The Prestcold Packaway range, with magnetic door seal, and the Tricity range were attractive, as well as the new G.E.C. 4-3 c.ft. refrigerator which has an internal light which can be seen to turn off before the door is closed. A.E.I.-Hotpoint's "Iced Diamond" was most striking and H.M.V. also showed a good looking model—the "Polar Star."

Lec earned full marks for originality with their ingenious "do it yourself" refrigerator—the "handyman." Designed for small compact kitchens, the refrigerator comes in the form of a fully insulated container, together with a fully hermetic compressor unit all ready for installation as part of a sink unit, kitchen unit, or any corner where there is space 22 in. high, 16½ in. wide, and 16½ in. deep, with room to store the compressor

alongside. Installation can be carried out, it is claimed, by the average handyman in a few hours. In the door liner there is a bottle rack, a butter compartment and an egg rack. The all-aluminium evaporator is hygienic, rust proof and scratch proof. There are two adjustable shelves in the container and the capacity is more than two c.ft. The price is 28 gns.

Housewives who went to the exhibition must have been bemused. For the assortment of refrigerators on view in this shop window, all attractive, all reliable, not only makes one all the more aware of the keen healthy competition which exists in this industry, but makes choice for both the layman and the expert a matter of the utmost difficulty.

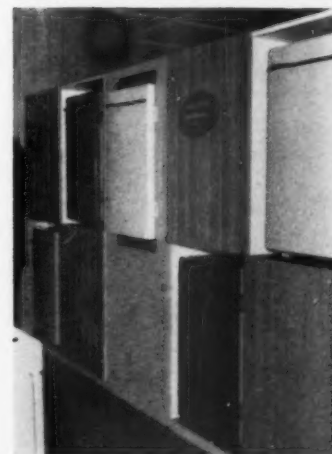
Electrolux had several attractive newcomers in the lower price range—the elegant model L.40 with 8 sq. ft. of shelf space, 4 c.ft. capacity and a low temperature compartment for 7 lb. of frozen food, priced at 59 gns.; the de luxe 26 with 5½ sq. ft. of shelf space,



AEG ▶



Creda ▶



English Electric ▶

2-6 c.ft. capacity and low temperature storage for 3½ lb. of frozen food, at 47 gns.; and the "sixteen" which can be put on a cabinet, hung on a wall or mounted on a stand. This model has 3½ sq. ft. of shelf space, 1½ c.ft. capacity

WITH "M.R.'s" CAMERA AT OLYMPIA



◀ Helimatic

Westinghouse, Canada ▶



G.E.C. ▶



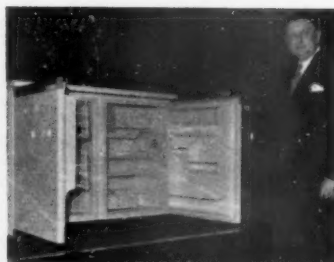
◀ English Electric



▼ Kenwood



▲ Electrolux



▲ Main



◀ Tricity



Lec home kit ▶

and low temperature storage for 2 lb. of frozen food, price 31 gns. A practical special feature was the "CannonLux" by Cannon (GA) and Electrolux, the first combined complete gas cooker and refrigerator unit.

The versatile 3.1 c.ft. "Lady K," was on show at the Kelvinator stand. This model has a "zero plus" freezer where frozen foods and ice-cream can be stored for several weeks, and yet is

compact enough for the smallest of kitchens. Only 19 in. wide, 34½ in. high, and 19 in. deep, it has a shelf space of over 5 sq. ft. The door opens into the cabinet width, enabling the refrigerator to be placed into a right or left hand corner of the kitchen. The Lady K is styled so as to fit in anywhere—on the wall, built-in, standing on units or cupboards, on its own, or under a working surface of normal height.

PRESTCOLD APPOINTMENTS

TWO WELL-KNOWN advertising executives at the giant Pressed Steel Company Limited, Cowley, Oxford, have been moved into important new jobs. They are Mr. Harry O'Neil (right) and Mr. Donald Fairbairn (left) who become advertising manager and export advertising manager, respectively. As part of a group publicity team directed by Mr. F. Moore and Mr. Peter Taylor, Mr. O'Neil is responsible for the company's press and TV advertising schedules. He also controls the production of advertising and sales promotion literature covering a wide range of products manufactured by Pressed Steel which includes car-bodies, refrigerators, railway rolling stock and, later on, aircraft and a wide range of domestic appliances. Mr. Fairbairn will be engaged on similar duties covering advertising campaigns throughout the various export markets. In addition, he will be responsible for organisation of co-operative advertising arrangements in which the company takes part.



FROZEN LAMB FOR THE U.K.—Mr. John R. Sharp (centre), joint governing director of Lansing Bagnall, manufacturers of fork trucks, reach trucks and other materials handling equipment, inspecting frozen lamb carcasses being prepared for export to the U.K. from West Australia. He was touring the premises of Brythwicks Ltd., of Albany, during a recent visit to West Australia as a member of a 10-man team of leading British industrialists invited by the State Government to go out there to investigate investment possibilities. "This was an example of some very good handling from the actual slaughter of the animals through to the cold store," said Mr. Sharp. The handling was carried out by overhead conveyors. Mr. Sharp added: "The young man we were talking to was very experienced and graded the carcass, i.e. prime quality for export and quickly rejected any that were unfit for consumption. With Mr. Sharp in the picture are Mr. John Glen, works director of Edward MacBean & Co., and Mr. H. Wincott, editor of the "Investor's Chronicle."

TEDDINGTON AT INST. R. BANQUET

This photograph taken at the Institute of Refrigeration's annual dinner shows some of the guests of Teddington Refrigeration Controls. From left to right are: W. H. Ascott (Rubery Owen & Co.); D. M. Brewer (Morphy Richards & Astral Ltd.); D. L. Baines (A.E.I.-Hotpoint Ltd.); T. A. Clibbon (Northcote Photographic Co.); S. S. Sherlock (Teddington Refrigeration Controls); M. A. Craig (Electrolux Ltd.); A. S. Allan (R. & A. Main); G. L. Hughes (Electrolux Ltd.); E. Burman (Teddington Refrigeration Controls) and Cdr. M. B. F. Ranken (J. & E. Hall Ltd.)



The Institute of Refrigeration Bulletin

Institute Headquarters: New Bridge Street House, New Bridge St., London, E.C.A (CENTRAL 4694)

MAY MEETING

At the meeting of the Institute to be held on Thursday, May 4, 1961, at 5.30 p.m. at the Institute of Marine Engineers, The Memorial Building, 76, Mark Lane, London, E.C.3, Mr. G. P. Smedley, B.ENG., B.MET., will read a paper entitled "Metals for refrigeration and other low temperature installations."

THE PRESIDENCY

It is with much pleasure that the members of council announce that Mr. C. M. Brain has accepted their invitation to be president of the Institute for the year commencing March 26, 1961. Mr. Brain, who is a vice-president of the Institute, has been a member for over 30 years and has served for a long period as a member and chairman of council and as chairman of the Institute's education committee: he is one of the Institute's representatives on the board of governors of the National College for Heating, Ventilating, Refrigeration and Fan Engineering.

EXECUTIVE COUNCIL ELECTION

Dr. A. J. Barnard, Mr. J. Douglas and Mr. K. C. Hales, corporate members, and Mr. S. B. Turner, associate, have been elected to fill the vacancies on the executive council caused by the retirement, under by-law 10, of Mr. E. M. Heap, Commander W. R. Sinclair and Mr. J. C. Taylor, corporate members, and Mr. E. W. Burman, associate.

HONORARY TREASURER

At a recent meeting of the executive council, Mr. T. A. Raymond was re-elected honorary treasurer of the Institute for the year March 26, 1961, to March 25, 1962.

THE EXECUTIVE COUNCIL, 1961-2

(March 26, 1961, to March 25, 1962)

President

Charles Maurice Brain

Past-Presidents

Engineer-Commander Walter Robert Sinclair, R.A.N.
(ret'd.), B.ENG.
Sir Rupert De la Bere, Bart., K.C.V.O.
Lieutenant-Colonel Lord Dudley Gordon, D.S.O., LL.D.

Vice-Presidents

Charles Maurice Brain
Stanley Fabes Dorey, C.B.E., D.SC., F.R.S., WHEX.
William Stoddart Douglas, B.SC.
Edward Frederick Farrow
Kenneth Lightfoot, O.B.E.
Henry Randal Steward, T.D., B.SC. (ENG.)

Elected Members of Council

Anthony John Barnard, B.SC., PH.D.
Kenneth Reginald Billinge
George Leslie Harper Bird, B.SC. (ENG.)
James Arnold Brewster
Kenneth John Rallings Cocke, B.SC. (ENG.)
James Douglas, B.SC. (ENG.)
John Carter Fidler, O.B.E., B.SC., PH.D.
William Bell Gosney, B.SC. (ENG.)
Raymond Walter Griffin, B.SC. (ENG.)
Kenneth Calvert Hales, M.A.
Godfrey Yate Pitts, M.ENG.
John Archer Stonebanks
Thomas Telfer, B.SC. (ENG.)
Stuart Browning Turner

AMERICAN PLUMBING, HEATING AND COOLING EXPOSITION

A study tour has been arranged by Ashton & Mitchell Travel Ltd., in connexion with the American Plumbing, Heating and Cooling Exposition, to be held in Detroit from June 19 to 21, 1961.

The tour, which will leave London on Sunday, June 11, and return from New York on Sunday, June 25, includes visits to a number of factories and installations.

The price of the tour will be £390, with a supplement of £20 for single room throughout the tour.

Full details of the tour may be obtained from Mr. D. J. Lloyd Davies, Ashton and Mitchell Travel Ltd., 2, Old Bond Street, London, W.1.

SYMPOSIUM ON THERMAL INSULATION

At the joint meeting of the Institute and the Low Temperature Group of the Physical Society and the Institute of Physics held on March 2, 1961, Mr. M. J. Hickman gave a paper on "Thermal conductivity standards and low temperature insulation."

Mr. Hickman said that in his talk he proposed to bridge the gap between the two previous papers by discussing the standard measures for measuring thermal conductivity, and particularly the guarded hot plate. He would give details of comparison tests made in various laboratories with this type of equipment, some results achieved, and reports made by the National Physical Laboratory and elsewhere of thermal conductivity at low temperatures, a simple method of measuring thermal conductivity between liquid nitrogen and room temperature, and also the effect of "through metal"—that is, the short-circuiting of insulation—and lastly, some data on the thermal expansion of insulating materials.

In measuring thermal conductivity of material in a slab form it was necessary to discover the heat flow. Heat flow was most simply measured electrically, and

it was important to make certain that the heat flowed in the desired direction. The area was fairly simple to measure, but the temperature difference required reasonably accurate measurement. Most samples of slabs of insulating material were flat, with parallel faces, which involved a considerable loss in accuracy. Although the amount of heat in one face could be measured, there was the problem of persuading all the heat to flow straight through to the cold side of the slab. The normal apparatus used for this purpose was the guarded plate apparatus, which was used for materials of a conductivity of 1 B.t.u. inch rings.

The basic idea was to get the central hot plate heated electrically by tape wound across a little plate. This gave a guard ring round the outside, and the aim was to heat the plate up to 10° C. A sample was placed on top, with a sandwich between the plate and an outside cold plate, the aim being to get all the heat put into the central hot plate to go up through the test sample. By maintaining this guard at precisely the same temperature as the central hot plate, no heat would flow in that direction. *(A slide was shown at this point.)*

This was difficult to do because it was necessary to suspend the central electrically-heated plate in the guard ring, to measure the temperature and to have some way of passing the heat across. The plates varied in size from 16 in. sq. down to 8 in. sq. In the test they had used a 12-in. sq. outside, and an 8-in. sq. in the middle, isolated by a 6-in. gap. The need for getting very accurate temperatures was indicated by the fact that one-tenth of 1° F. between the inner and outer plate would give an error of 1 or 2 per cent. of thermal conductivity.

The author illustrated the apparatus, consisting of a flat plate wound carefully to give a uniform conductivity. The samples were sandwiched each side of the hot plate, and outside there were two cold plates. The two cold plates could be cooled either by passing ice and water through them or a water-glycerine mixture. There was a similar kind of apparatus consisting of two cold plates cooled by solid CO₂ or by liquid nitrogen. Mr. Hickman's next slide showed the apparatus assembled, with the hot plate horizontal, a test sample and two cold plates. This type of apparatus, in various sizes, was widely used throughout the world. It was difficult to prevent heat losses and the accuracy of the apparatus depended on ensuring that heat transfer between the hot plate and guard ring was at a minimum.

Several years ago a comparative test was arranged in the United States by the Bureau of Standards, when samples of cork slab were measured there and sent to 20 laboratories. It was interesting to note that the apparatus in 15 of the laboratories gave results which were within plus and minus 3 per cent. of the value obtained by the Bureau. Five others varied by not more than plus or minus 15 per cent., and the speaker believed that in the case of these five there was something wrong with their equipment.

Some material from the Bureau of Standards had recently been measured at the National Physical Laboratory. This consisted of semi-rigid glass-wool board with a density of about 5½ lb. per c.ft. They

had measured it from 20° to 100° F. and the results were between plus and minus 1 per cent. of the Bureau's value.

At the International Institute of Refrigeration meeting in Prague a few years ago Dr. Griffiths had suggested that it would be useful to inaugurate a comparative scheme of a similar type amongst the members of the I.I.R. because there had been some discordant results in thermal conductivity values. The N.P.L. had therefore offered to supply some thermal conductivity samples so that they could be distributed to other countries for measurement, in order to find out the difference so that the errors in the apparatus could be ironed out. This might eliminate many of the discrepancies. One problem was to obtain suitable material and, although not ideal, cork board might be suitable for this purpose. The N.P.L. already had a scheme whereby the several testing laboratories in this country making thermal conductivity apparatus could be supplied with slabs of cork board of known thermal conductivity, and in general they agreed fairly well.

Before discussing thermal conductivity data obtained by the laboratories, the speaker said it would be useful to discuss heat transfer through insulation. This was mainly concerned with low temperature insulation, and it would be well worth while considering the various ways of conducting heat through insulating material, dealing mainly with cellular structures and glass fibre or mineral wool type materials.

Heat transfer occurred in four ways. First, through heat flow in the gas; secondly, as a result of convection in the gas; thirdly, by radiation; and fourthly, by conduction through solid material. The relationship between these four ways was shown by the fact that in the case of an expanded plastic or cellular plastic with air in it, the normal refrigeration temperature amounted to 65 per cent. The radiation in this was 5 per cent. and the conduction through the solid was about 25 per cent. In the case of conduction through a solid, say polystyrene, 2 lb. per c.ft., normal refrigeration temperature, conductivity was 0.22, whereas in the case of cellular glass it was 0.35.

Convection was controlled by the size of the pores in porous insulation or by the size of the fibre in fibrous insulants. The size required, ½ in., was getting down to the "diminishing returns" level.

Radiation was also affected, because the number of barriers between the hot and cold faces increased.

In the case of heat transfer through gas, normally this gas was air because it cost nothing and was readily available. There was no trouble in keeping the gas in. The conductivity of air at 32° F. was 0.17. At minus 100° F. it was down to 0.12. So, in general, as the temperature of an insulation fell, conductivity fell also (*this point was illustrated on the screen, showing polyurethane foam*).

In the case of CO₂ there was a conductivity of 0.10, which was an improvement on the room temperature. The only snag was that CO₂ diffused itself and within seven or eight months the conductivity of the material was back to its air level. So not only did they want to put a gas into the insulation to improve it, but to

keep it there, and one problem was to know what gases were present and how they differed. For instance, R.11, one of the refrigerant gases, had a conductivity at about normal refrigeration temperature of 0.06, so that they were down to one-third that of air, and its probable value was 0.04 at minus 100° F.

Measurement of an insulating material containing R.11 showed that it started at about 0.14 and in six months this had increased to about 0.17. They were not sure whether this was due to the R.11 gas diffusing out or whether water vapour or CO₂ was diffusing in, because water vapour had a conductivity of 0.12. So not only did they have to keep out the normal gases in the air, but water vapour as well. It was hoped to do some work on that problem soon, in order to decide which was the more likely effect.

The apparatus used by works in the United States to measure the thermal conductivity of materials at low temperatures was next illustrated. This method measured not the heat put into the sample but the heat which leaked out or came through the other side. It consisted of a metal, brass or copper surface cooled by means of liquid oxygen. Any heat coming through the sample flowed into the calorimeter. All that was necessary was to measure the faces of the sample. The National Physical Laboratory was proposing to install a similar apparatus and hoped to show that the heat going in equalled the heat leaking out.

Some of the results of the conductivity of materials were tabulated by the author. From this it appeared that the two methods were probably in agreement. This probably meant that the guard plate could be used down to low temperatures, using liquid nitrogen on the cold face.

Reverting to heat transfer through gas, the speaker said that air could be replaced not only by R.11 but by water and also ice. Water had a conductivity of about 32.4 compared with that of air, which was 0.17. If, therefore, water replaced air in the insulation, there would be a large increase in thermal conductivity. In fact, cork board, which normally had a conductivity of 0.27, would increase to about 0.6 if it had about 150 per cent. by weight of water, which was roughly equivalent to 23 per cent. The position would be worse with ice in the insulant, because ice had a conductivity of about 17 at this temperature, so that if the air in the insulant was replaced with ice, the result would be far worse. A sample with 17 per cent. volume of ice in it at minus 50 would go up from 0.2 to 0.6; in other words, it would increase three times in temperature if it contained 17 per cent. volume of ice. The moral was to keep water or ice out of the insulation, and instead of spending too much money on fancy mats, it was far better to spend it on a good barrier.

A simple apparatus for measuring thermal conductivity of insulating materials, used a lot in industry, was screened. It consisted of a metal container which could be filled with liquid nitrogen, surrounded by another metal container. This was put on a weighing machine and after an hour the container could be weighed and a calculation made of the amount of heat which had leaked through the insulation, showing

the heat flow. This method gave reasonable agreement with the ordinary apparatus.

The speaker next dealt with the problem of "through metal," which was troublesome in the aircraft industry. In modern aircraft the air temperature of the outer skin might be minus 60° F., whereas the passengers inside the structure must sit in a reasonable temperature of, say, 60° F. To meet this, fine fibre glass wool insulation was placed on the inside, but the ribs projecting inwards interfered with the heat flow. A further diagram depicted the apparatus used to measure heat transfer through such a structure which had an aluminium skin with aluminium girders bolted to it. The results obtained from tests on this apparatus were startling. A test on a panel with 2 in. of glass wool on the inside resulted in a heat transfer through it of about 20.

Finally, the speaker dealt with thermal expansion, and described a simple apparatus consisting of silica tube with silica rods set on top of a test sample. The percentage change in length of thermal insulators, from ambient temperatures down to minus 320° F., was given on the screen.

FORTHCOMING MEETINGS OF THE COMMISSIONS OF THE INTERNATIONAL INSTITUTE OF REFRIGERATION

During 1961 the undermentioned Commissions of the International Institute of Refrigeration will hold meetings as follows:

Commission 1.—Low temperature physics and thermodynamics. Meetings at the end of September in London (United Kingdom).

Commissions 2, 3, 6A, 6B and 8.

Commission 2 (transfer of heat, instrumentation, insulating materials); Commission 3 (design and construction of machinery for refrigerating and air-conditioning plants); Sub-Commission 6A (air-conditioning); Sub-Commission 6B (application of refrigeration to industries) and Commission 8 (refrigerated transport by water), will meet on **September 20 to 22, 1961 in Cambridge** (United Kingdom).

The main subjects which will be discussed during these meetings are as follows:

- Insulating materials: properties and measurements (Commission 2);
- Piston compressors: design, test, special compressors, influence of the characteristics of the refrigerant on operation (Commission 3);
- Technical questions special to refrigeration and air-conditioning on board ships (Commissions 3, 6A and 8);
- Application of refrigeration to chemical industries (Commission 6B);
- Ventilation of fruit loads. Construction of air ducts for refrigerated spaces on board ships (Commission 8).

The meetings will be completed by a programme of technical visits, in particular, to the laboratories of the Engineering University.

Those intending to present papers at the meetings of these Commissions on the above-mentioned subjects are requested to inform the Presidents or Secretaries concerned as soon as possible and to send summaries (about 200 words) of their papers before May 1, 1961.

Commission 2: Professor C. F. KAYAN, Mechanical Engineering Department, Columbia University, New York 27, N.Y. (U.S.A.);

Commission 3: Mr. G. L. H. BIRD, Durlough Croft, Poplar Avenue, Norwood Green, Southall, Middlesex (U.K.);

Sub-Commission 6A: Mr. J. TIREL, C.O.S.T.C., 7, rue du 4 Septembre, Paris, 2, (France);

Sub-Commission 6B: Professor Dr. H. F. K. GLASER, Bottingerst. 6, Göttingen (Germany);

Commission 8 : Mr. T. TELFER, Lloyd's Register of Shipping, 71 Fenchurch Street, London, E.C.2. (U.K.).

Commission 4.—Foodstuffs and agricultural produce.

Colloquium on the storage of fruit and vegetables on May 23 to 26 in Wageningen (The Netherlands).

Commission 5.—Cold stores and ice-making plants.

Meeting on August 23 to 26 in Budapest (Hungary).

The commissions will study the following subjects :

- Prefabricated elements of reinforced concrete in the construction of cold stores ;
- Insulation of cold-store ceilings ;
- Handling and palletization ;
- Processes to accelerate tunnel freezing ;
- Use of new insulating materials ;
- Air-screens and micro-climates ;

— Construction of a fruit station for packaging and shipment.

In addition, papers will be read on the refrigerating industry in Hungary and visits of cold-stores are envisaged.

The summaries of the papers to be read at these meetings must be sent as soon as possible to the address of the president of commission 5 and the papers themselves must be sent to him before May 1, 1961.

President of Commission 5 : Mr. J.-B. VERLOT, Service Commercial de la S.N.C.F., 54, Bld. Haussmann, Paris (France).

Sub-Commission 6C.—Biology and medicine.

Meetings at the end of May in Belgrade (Yugoslavia).

Commission 7.—Refrigerated transport by land and by air.

Meetings on June 1 to 3, in Padua (Italy).

CHRYSLER FORMS U.K. COMPANY TO MARKET AIRTEMP

A British company has been formed by Chrysler International to expand marketing throughout the United Kingdom of its Airtemp refrigeration, air-conditioning and heating equipment and of Chrysler marine and industrial engines.

Chrysler Airtemp Ltd., as the new company will be called, is to operate from the Kew, Surrey, factory where Dodge Brothers (Britain) Ltd. manufactures British Dodge trucks and where Chrysler Motors Ltd. has its spares and service depot for Chrysler and Simca cars.

Among its directors are Mr. P. N. Buckminster, formerly president and managing director of Chrysler International, S.A. and now assistant general manager of the Dodge car and truck division of Chrysler Corporation, Mr. E. P. Lions, director, special products division of Chrysler International, and Mr. W. K. Bradley, who has been in charge of region II of Chrysler International Special Products Division, hitherto responsible for Airtemp marketing in the U.K. and now absorbed by the new company. Mr. Bradley will, in addition, be its general manager.

TWO-TEMPERATURE ICE CREAM CABINET

A TEN C.F.T. capacity, two-temperature refrigeration cabinet designed specially for ice cream sales vans, is now in production at the Loughborough works of Metcold Products. A director of the firm, announcing

the new product, says : " It is the latest advance in this particular field because it is a completely self-contained unit."

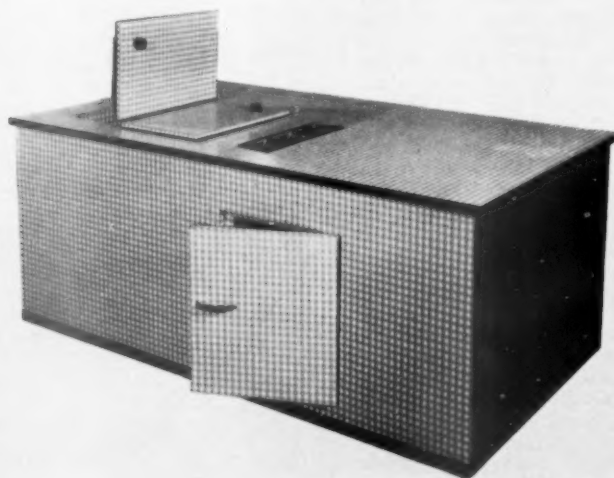
The refrigerator, which has been named the " Dua-freeze," consists of two storage compartments each of at least 5 c.ft. capacity ; one for storing ice cream at 0° F. until sold over the counter and the other for storing tins of soft ice cream at 37° F. until in an ice cream machine.

Flip-flap lids are fitted to the low temperature compartment and a side opening door to the high temperature compartment which has been designed to take the maximum amount of soft ice cream in standard size tins. A stainless steel three division coin tray is recessed into the refrigerator top.

An uncommon, but economical feature of the " Dua-freeze " is that only one compressor unit (1/3 h.p.) is used to maintain the temperatures of both compartments. This unit maintains the correct temperatures by means of a generator while the van is travelling and from mains electricity supply while the van is garaged. This obviates ice cream losses which occur because of temperature drops when using temperature hold-over plates and avoids the bad habit of double freezing.

The Formica finished " Duafreeze " was designed for use with BMC vehicles but individual modifications can be made. Standard measurements of the refrigerator are : width, 66 in. ; height, 27 in. and length, 38.

The " Duafreeze " is available to all overseas markets and can be supplied with or without the compressor unit.



The new " Duafreeze " refrigerator for ice cream sales vans, made by Metcold Products, of Loughborough.

Preview of

International Refrigeration Exhibition

Earls Court, London

April 11-14, 1961

This exhibition is devoted entirely to machinery and equipment for every kind of refrigeration, air-conditioning and mechanical cooling application. The convention will include the reading and discussion of papers on the practical aspects of refrigeration. The organizer is Mr. P. Smyth.

The various uses of aluminium in the fields of refrigeration and air-conditioning form the theme of Alcan Industries' exhibit. Items incorporating "Noralduct" which is supplied by this company are given particular attention.

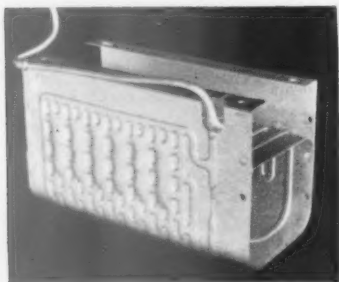
"Noralduct", in which the labyrinth of tubes is integral with the sheet itself, can be produced to virtually any required pattern. The items on display include the lining for a frozen food merchandizer, the evaporator unit of a domestic refrigerator, separator plates for frozen food display and an all-aluminium milk storage tank. In a somewhat different field is an example of transistorised electronic equipment with "Noralduct" effecting temperature stabilization. The "Noralduct" process is outmatched in versatility by extrusion, whereby tubes and sections—both solid and hollow—are produced. A great variety of shapes can be extruded, and refrigeration is one of the many fields in which such latitude has

proved advantageous. On exhibition is a freezing plate, used in producing frozen food packs and ice cream hardening cabinets, which has been built up from a finned multi-hole extrusion. The plate consists of separate lengths of section laid side by side and joined by welding. Such use of extrusions, specially designed for efficient heat exchange, is also represented in longitudinally-finned tubes, which are being produced in several sizes and patterns. Several types of helically-finned tubes, now being widely used for heat exchangers, are on display. They include those in which the exterior fins are formed integral with the tube—with and without interior fins formed by extrusion—and others in which the tube is extruded and the fins made from strip. "Noratrace," the newest commodity on show, is also produced by extrusion. It takes the form of a double-holed tube, the smaller hole providing the trace line which can be used for steam, refrigerant or hot-gas defrost. It is offered in three sizes, and the display includes flange fittings and two methods of jointing. Alcan Industries has been producing the usual round tube for many years. A more recent development, and one specially applicable to heat exchangers, is clad tube, in which, during the extrusion process, strong alloy tube is clad inside with an alloy that gives sacrificial protection to the core. The efficiency of the weld is demonstrated by photomicrographs. Of the widespread uses of aluminium sheet, attention is drawn to ice trays and insulation cladding (for example, the lining of refrigerated vans), and among several applications in the

field of air-conditioning, ducting should be given special mention. A more unusual application is corrugated sheet as a protection for pipe insulation, the corrugations running either longitudinally or, for negotiating corners, circumferentially.

R. A. Bennett & Co., offer the trade in the midland counties a full coverage of almost all the trade's day-to-day requirements plus a personal technical service. They feature their stand as a "Midlander's Rendezvous." Bennett's new self-service warehouse is featured pictorially to provide a background picture to the services offered. On show for the first time are examples of the new "Barman" and "Barmaid" bottle coolers and "Cellarmaster" cellar cooler produced by HED, Hyde, Cheshire and distributed in the Midlands by Bennett & Co.

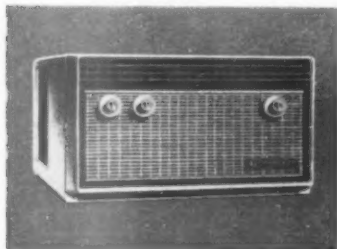
A working model of a refrigerated container insulated with "Rocksil" rock wool is a central feature of the stand of Cape Insulation and Asbestos Products Ltd., a subsidiary of The Cape Asbestos Co. Ltd. Part of the side of the model container will drop to show how the "Rocksil" has been fitted and another section will lower to reveal the lit-up interior. The container will be a model of one built by Duramin Engineering Ltd., of Lydney. Another display will show the uses of "Rocksil" for the insulation of domestic refrigerators and deep-freeze units. From a cut-away Morphy-Richards "Astral" table-model refrigerator visitors to the stand will be able to see the



Single inlet/outlet system with internal capillary produced at Alcan Industries Ltd.

resilience and consistency of rock wool fibres when used for this important insulation application.

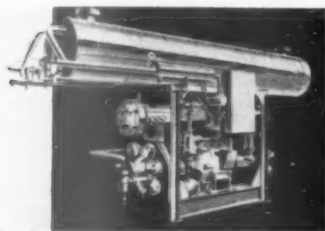
Among the equipment shown by the **Special Products Division of Chrysler International** are room and packaged air-conditioning units, compact water chillers and condensers. Of particular interest is the 1 h.p. room unit. It is designed to operate on the reverse cycle principle, which means that it is capable of either heating or cooling, depending on the requirement of the user. This principle is popular not only because of its dual function but also because the heat output which it provides is some 25 per cent more than the electrical input. The



Chrysler Airtemp automatic cooling unit.

method of operation is based upon the utilisation of the heat that is normally dissipated to the atmosphere through the condenser. This heat is brought into the operative space through filters thereby enabling the unit to serve a dual purpose. There is a comprehensive selection of room units ranging from 1 to 2½ h.p.

Also shown are packaged units, developments from the original ideas of the founder of the company. Considerable attention has been paid to the design, stability and functional appearance of the packaged units and the free-standing



Chrysler Airtemp packaged liquid chiller.

Console type in particular, despite its large duty capacity takes up a small floor area. A 3 h.p. unit, with an output of 30,000 B.t.u./hr and 1200 c.f.t. of air per minute, requires a floor area of only 35 in. by 20 in. The complete range of this equipment covers units of 3, 5, 7½, 10 and 15 h.p. These units utilise a hermetically sealed, direct drive compressor, designed and manufactured by Chrysler.

Crawley Bros. Ltd. are exhibiting six different types of "Acro-kool" dispensers and examples from their range of water coolers. The dispensers include the standard dispenser for squashes and fruit juices and also models adapted for coin operation and for self-service. Also on show are the Acro-kool iced-milk dispenser carrying the new canopy as designed for use by the Milk Marketing Board, and the special dispenser for use with such heavy beverages as tomato juice, certain Commonwealth fruit juices and milk drinks such as chocolate-milk. A dispenser operated by a charge of cracked-ice and suitable for mounting on ice cream vehicles, etc., is also shown.

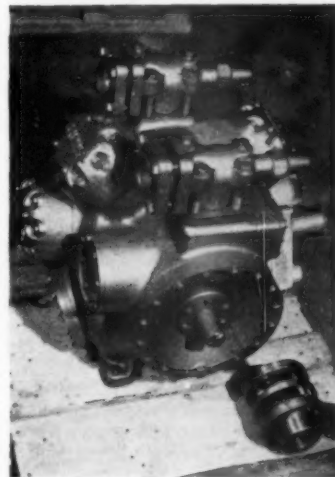
The water coolers on display include the inverted-bottle type which, being independent of the water mains and of drainage, requires only a connection to an electric point. On show also is an example of the more powerful general service of heavy-duty type of water cooler.

Certain items of beverage dispensing and vending equipment of U.S.A. origin are also being exhibited. These include a special demonstration "Sodamaster" beverage-producing unit incorporating the Mix-Monitor faucet. This is a completely equipped carbonating unit for the service of a range of carbonated beverages from one single faucet. The unit can be installed remote from the service counter. Two types of dispensing points are displayed—one for counter service and the other for waitress service. In each case the service lines and faucets are effectively cooled throughout by means of circulating chilled water, ensuring the delivery at the faucet head of ice-cold, carbonated drinks.

Also on view are two examples from the Tyler "Champion" bottle vender range. These are: the VD220 open showcase merchandiser with lighted, mirrored superstructure, and equipped with a coin-operated mechanism for bottle selection and delivery—and the VU210 fully-automatic, upright, four-flavour selection, coin-activated vending unit.

REFRIGERATION EXHIBITION

Dunham-Bush Ltd. have a number of products on show including a wide range of condensing units. The Brunner-metic units are available in the following series: (a) air-cooled, (b) water-cooled, (c) combination air- and water-cooled, (d) capillary tube, (e) truck, (f) remote condenser



A Brunner-metic condensing unit.

system models. Compressor capacities range from ¼ h.p. to 15 h.p. Altered construction permits easy dismantling for servicing, whilst a suction gas-cooled motor contributes to a higher efficiency and longer life. Crankshafts are dynamically and statistically balanced for smooth operation.

The new multi-drive line consists of compressors and condensing units, in a range of capacity from 7½ h.p. to 100 h.p. inclusive, with a temperature range suitable for air-conditioning and refrigeration applications. These are obtainable in three models—belt driven with fly-wheel, semi-hermetically sealed and direct driven. Those models employing belt-drive and direct-drive are available with R.12 and R.22 refrigerant, having a range of capacity from -30° to +50° F. They are obtainable with a water-cooled condenser, or as a compressor unit for application with evaporative condensers or other refrigerant condensing mediums. The new hermetic compressors and condensing units are available with R.22 refrigerant only. This line has been designed specifically for air-conditioning applications, both industrial and comfort cooling. The temperature range is from +10° to +50° F.

Heat-X cleanable shell and tube

REFRIGERATION EXHIBITION

condensers are produced in a wide range of sizes, 5 to 100 tons. These heavy-duty, high-capacity condensers are specifically designed to simplify the mechanical cleaning necessary in areas where poor water conditions exist. Large numbers of small tubes, with high ratio, extended fin surface or aluminium, produce high heat transfer efficiency. Internal condenser rigidity is assured by combining five tubes to a bank. These banks are securely bracketed internally to provide a rigid, vibration-free tube bundle.

The C.I.C.B. cleanable inner-finn condenser is designed for water-cooled applications. The entire water-circuit is of non-ferrous construction, with cleanable tubes, making it possible to maintain high efficiency. The inner fins in the refrigerant tubes permit a compact arrangement, and provide many extra square feet of surface. The result is a minimum size, maximum heat transfer.

The Dunham-Bush C.R. and M.C. lines have been developed especially to meet all the requirements for a central-station air-conditioning system, for heating and cooling by water, or direct expansion, for vertical floor mounting in exposed or recessed installations, for ceiling-suspended, exposed or fully recessed installations, and for the introduction of fresh air through unit.

Edmundsons Supply Corporation Ltd., are showing a range of Frimatic refrigerators from 5 c.ft. to 9-25 c.ft. (capacity), including a new 5 c.ft. model with a table top which retails at 59 gns. Of particular interest is the Frimatic ice cream mixer, which plugs straight into the freezer compartment and performs the process



Frimatic International 1401.

of mixing and freezing the ice cream automatically. The motor stops automatically as soon as the ice cream has reached the right consistency. They may be used by attaching a lead in any type of refrigerator. Also on show is the "Summit" bottled gas refrigerator which has a capacity of 1.25 c.ft. and a noiseless absorption unit. The machine operates on Butane or Propane bottled gas. The gas cuts off automatically if the flame is extinguished.

A highlight of the Ekco Plastics display is a range of injection moulded refrigerator liners, including the largest yet produced in this country—a 5-c.ft. model for Frigidaire. In cases where an economically-large run is called for, the injection moulding of refrigerator liners presents a number of advantages. Wall thicknesses can be chosen to fulfil exact requirements at all parts of the



Picture shows components injection moulded by Ekco Plastics Ltd.

liner, while the post-production operations necessary after vacuum forming are eliminated, openings, fixing bosses, etc., all being moulded-in.

A selection of door liners and other liners vacuum-formed from sheet material shows the considerable scope for this process in the refrigeration field. Smaller in size are many components illustrating the increasing role being played by plastics in the refrigerator manufacturing industry. These include door shelves, drip trays, evaporator doors, dishes, etc. In many of these components can be seen evidence of the extensive range of finishing processes available, including colour-styling on both transparent and opaque mouldings, the insertion of insulating material and hot stamping.

Two members of the Elliott-Automation Group are exhibiting,

Elliott Brothers (London) Limited (Food and Marine Division), and Sauter Controls Limited. They are exhibiting the following products:—

The Elliott CO₂ and O₂ analysing panel, designed for refrigerated fruit stores. This equipment enables an operator to regulate the carbon dioxide and oxygen gas concentration in the storage chambers from a central control station. The Elliott multi-point temperature indicating equipment, which is frequently used in conjunction with the CO₂ and O₂ analysing panel. The instruments are connected to resistance thermometers installed in the storage chambers.

Elliott's "Bristol" temperature and pressure recorders are extensively used for monitoring conditions inside refrigerators. The instrument exhibited is fitted with a temperature system only and is designed for recording blood-bank temperatures. Special alarm-con-

tacts give warning of out-of-limit temperatures at both ends of the range. The Elliott "Bristol" multi-point dynamometer is used in conjunction with thermo-couples or resistance thermometers for testing refrigerators and refrigerated display cabinets. The Elliott humidity transmitter makes use of resistance thermometer wet and dry bulbs. It is used in conjunction with a "Bristol" multi-point dynamometer, calibrated to show relative humidity.

Exhibits of Sauter Controls Ltd., include a representative selection of electro-mechanical, electronic and pneumatic control systems, and examples of electro-mechanical and pneumatic operators mounted on valves of various sizes. They include type DFC pressure switches—designed to cover the range 0-1 atmosphere and particularly suitable for use with refrigerants, the Sauter 4-in. through valve, which can

handle 5,200 lb. of ammonia per hour at a pressure of 37 p.s.i.g. and a temperature of 23° F., and the Sauter amplifying relay, which is used in conjunction with a sensing transmitter and a regulating unit and makes possible a "proportional plus integral" type of control system.

Fenton, Byrn & Co. Ltd., are showing their range of propeller fans, manufactured in sizes from 6 in. diameter to 36 in. diameter, with motors to suit all voltages and speeds and suitable for use in cold temperature starting conditions. Other factors of design render them well suited to refrigeration equipment components. In addition they are displaying a range of separate impellers for customers use and other items of general interest.

The General Electric Co. Ltd. are showing a complete range of refrigerators comprising 2.6 c.ft., 4.3 c.ft., 6 c.ft., 8 c.ft. and 13 c.ft. models, as well as two air-conditioners. The smallest in the range, a new 2.6 c.ft. absorption refrigerator, has a shelf area of 5.6 sq. ft. Interior cabinet furnishings include three ice trays, defrosting tray and three steel shelves. A fully enclosed ice making compartment has a capacity of 168 c. in. for the storage of frozen foods. The steel cabinet, finished in white or honeysuckle, has a one-piece powder-blue polystyrene interior. Also of powder-blue polystyrene, is the inner door panel which contains three bottle racks and one egg rack in white. Price is £49 7s. 0d. including purchase tax.



The G.E.C. 4.3 c.ft. refrigerator.

Three shelves provided inside the new 4.3 c.ft. refrigerator give 8 sq. ft. of shelf area. There is also a full width freezer compartment that can store 17½ lb. of frozen food in addition to the ice-tray, which makes 27 cubes of ice and a salad container. Incorporated in the inner door panel are two shelves for the storage of milk and packaged groceries, a rack for eight eggs, and a butter compartment with its own spring-loaded door and removable butter dish. Supplied in white or honeysuckle, this refrigerator has a table top of heat-resisting and stain-proof "Decor-Plast," finished in either red or blue. Price is £65 10s. 0d. including purchase tax.

In the 13 c.ft. refrigerator four shelves give a shelf area of 16 sq. ft. Other fittings include two ice moulds, one plastic ice tray and four bottle racks in the door. A non-refrigerated drawer at the base of the cabinet provides room for the storage of cooking utensils and other ancillaries. The refrigerator is mounted on rubber wheels.

Excess humidity at a rate of up to five pints of water every hour can be removed by either of the two air-conditioners shown. They are designed to work under the most extreme tropical conditions. One of these is air cooled and can be fitted in windows, over 29 in. in width, or walls. The unit is 18 in. deep and has built-in thermal overload devices and automatic defrosting thermostats to ensure round-the-clock operation.

The water cooled air-conditioner is for use in rooms having no access to outside air. It can be fixed on any wall that has connection to a constant water supply and is fitted with a high pressure cut-out, in case of a water supply failure. Like the air cooled model, it has automatic defrosting thermostats.

Heat Pump & Refrigeration Ltd., exhibit a wide range of products including the "Econom 'W'" a unit specifically designed for economical cellar and store cooling. The unit is completely self contained and is constructed so that no heat from the condenser or compressor re-enters the cellar, it cools the space in which it is located, dehumidifies the space, re-circulates the air, and reduces the dust content. The "Econom 'W'" comprises a Sterne-Tecumseh sealed motor compressor, condenser, evaporator, heat exchanger, refrigerant lines and pressure reducing device, assembled into a hermetically sealed system. Another unit the "Econom"

REFRIGERATION EXHIBITION

has similar features, but in addition is designed to give a hot water supply, thus providing three services—cooling, dehumidifying, and supplying hot water—all in one unit.

There are several models of the H.P.R. bottle cooler, which can be used for cooling lagers and beers, as well as mineral waters, soft drinks and milk. Model ST is a portable bottle cooler with the unit



An H.P.R. bottle cooler.

housing adjacent; model ST/U comprises a single cooling shelf with the unit mounted underneath; model LC, is specifically designed for lagers and has a single cooling shelf; model 2T has two cooling shelves with the unit interposed between the shelves; and model 3T has a three cooling shelf arrangement with the unit interposed between the two lower shelves. The refrigeration systems are completely sealed and powered by a Sterne-Tecumseh sealed motor compressor.

Amongst the other products is the Uni-Temp which warms in the winter, cools in the summer and cleans, circulates and dehumidifies the air. The room is thermostatically controlled and if properly insulated the temperature will not vary more than $\pm 2^\circ$ F. from that required. When heating, the Uni-temp produces approximately three units of heat for every heat unit of electricity it consumes.

Helimatic Ltd. are displaying a new Elektroheliolios deep-freeze display cabinet which they are introducing into Britain. It is the Helifrost 17.5-c.ft. cabinet with an automatic defrost in the superstructure where practically all ice is formed. A manual defrosting of the elements in the walls may be required only once per year in case of moisture in the air. The water evaporates automatically—consequently no sink connexion is needed.

Even and economic refrigera-

REFRIGERATION EXHIBITION

tion gives the right temperature in the cabinet for the storage of frozen foods which is 0° F. (-18° C.) and lower. There is also a built-in condenser unit which simplifies the installation of the cabinet. The Tecumseh compressor, made by Sterne of Glasgow, is hermetically sealed and built to the longest life span possible.

The display cabinet is of modern design with stainless fittings giving durable protection to the cabinet. The whole display area can be seen



An Elektrohelios "Helifrost" 20.5 c.ft. upright freezer.

through the built-in front glass, which consists of four thermopane sheets. These are hermetically-closed chambers containing dry air between the sheets which gives good insulation and clear sight. New fluorescent lighting gives illumination to the cabinet interior. Separate switches control this lighting. The low-type superstructure accommodates a large stock of related items. Around the front glass and other exposed places there are heating coils to eliminate the production of water by condensation. A special slide-out night cover in the superstructure gives efficient protection at night and reduces the current consumption. Compartment partitions are adjustable to accommodate all sizes of packages, which together with convenient shallow depth assures easy accessibility.

Helimatic also display four Elektrohelios deep freezers with capacities of 7.6, 9, 13 and 14.6 c.ft., and upright models of 13, 17 and 20.5 c.ft. All these are capable of producing a temperature of -13° F. or

lower for freezing down, and maintain a storage temperature of 0° F.

H.R.P. Ltd. are exhibiting a new and improved range of the SAER equipment they import which includes electric, water and hot gas defrost coolers. Also included is a range of air-cooled condensers and other ancillary equipment.

A special feature on this stand is a working model of the electronic leak detector, manufactured by Edwards High Vacuum, Crawley, Sussex. Other exhibits include: "Thermophil" electronic thermometers, A.E.I. electronic portable leak detector, Teddington refrigeration controls—"Armaflex" and flexible lines.

Brass flared fittings and valves manufactured by this company are also displayed which includes a complete range of sweat unions, tees and elbows from $\frac{1}{8}$ in. O/D to $\frac{1}{2}$ in. O/D. For the larger size copper tubing a range of MBL copper to copper fittings are stocked suitable for silver soldering, brazing or soft solder.

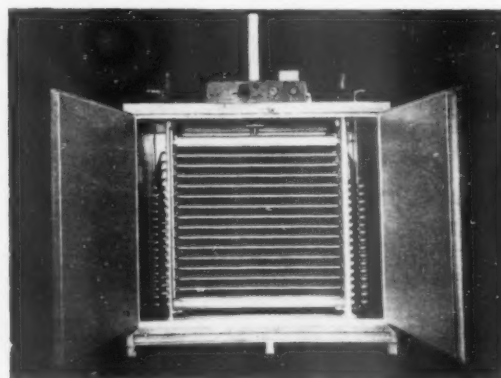
Five **I.C.I.** divisions—dyestuffs, metals, heavy organic chemicals, general chemicals and plastics—share a stand at Earls Court. Marston Excelsior Ltd. and Imperial Aluminium Co. Ltd. (I.C.I. subsidiary companies) are also represented on the stand. Dyestuffs division is showing lightweight rigid polyurethane foams for insulation

and Impalco aluminium is also on display. This heat exchange material consists of integral parallel tubes in a single thickness of strip material, and finds use in solar energy heaters, radiators, and heated or cooled chambers for food processing. Impalco roll-welded heat transfer sheets, which form another section of the display, are used principally for refrigerator evaporator panels. Marston Excelsior Ltd. is also represented in this display. They are showing part fabricated evaporator units and, in photographic form, a variety of Marston Excelsior products for refrigeration and air-conditioning plant. "Thermocal" DF, the improved heat transfer medium containing special corrosion inhibitors for industrial refrigeration systems, is featured by heavy organic chemicals division, while general chemicals division illustrate the varied applications for the "Arcton" range of refrigerants. Plastics division include in their display "Darvic" rigid p.v.c. sheet for refrigerated shop counters and deep-freeze units, and "Flovic" vinyl copolymer foil for refrigerator linings.

Jackstone Froster Ltd., of Grimsby—a Ross Group Company—are exhibiting a 15 station model from their range of double-contact plate freezers.

Many units form a range which offers 7 to 20 station models with capacities of $1\frac{1}{2}$ to 18 tons per day.

In the larger sizes Jackstone



Jackstone 15 station double plate freezer.

in ships and road transport. Flexible polyurethane foams for insulation, packaging and shock absorption are also featured. The joint Metals division/Impalco display includes "Integron" high-fin and low-fin integrally finned tubes in copper, aluminium and bi-metal forms for refrigeration and air-conditioning plant. "Tube-in-Strip" in copper

freezers are specifically designed to operate from detached refrigerating units or for connecting to available compressor capacity or low temperature cold store plant. They can be supplied with a choice of plate sizes and plate openings for installation on land or on ships and suitable for ammonia, brine or "freon" operation. In addition

two completely self contained, easily transportable units, which are "freon"/"arcon" operated, are displayed.

Lec Refrigeration Ltd. are exhibiting a complete range of refrigerated cabinets, from the domestic models to a low-temperature sub-zero cabinet. There are three display cabinets, the "Super Salesman" GS.91 is a frozen-food display cabinet with an all-steel shell, air-cooled condensers of the type which never clog up with dirt, and a gross capacity of 11.4 c.ft. In addition it has a slide away night cover and a large "hollowseal" vacuum-sealed glass panel to give maximum vision. Especially featured is the RD.71 chilled food display cabinet, which has a slide away night cover, full length fluorescent lighting, a factory installed steel compressor and a wide-open top and deep glass front.



Lec display cabinet.

Height is 41½ in. and the floor space taken up is 46 in. by 30 in. Model C.D.35 is designed specifically for the conservation of ice cream and/or frozen foods. By rotating the control any desired range of temperature can be obtained from 20° to 0° F.

The Universal Freezer CF.50 has slab cork and resin bond insulation, and is sealed against ingress or moisture. It measures 42 in. high, 28 in. wide, 58 in. long. Any desired temperature may be obtained between 20° and -5° F. The upright freezer, model H.F.40, has 8 sq. ft. of shelf area. Each of the three shelves is refrigerated, and the unit incorporates a single-cylinder compressor with split-phase motor and a very low electric current consumption. Model S.18 is in two sections; the upper section has a large capacity of normal refrigeration space with four adjustable sliding shelves, while the lower section gives long-term storing space for approximately 210 lb. of frozen foods. Two sliding storage baskets bring the food out for easy access.

Other Lec features are a 44-in. bottle cooler, a 13-c.ft. self-contained cold room, a fish cabinet with six roll-out draws and a 13-c.ft. capacity, a low-temperature sub-zero cabinet ranging from 100° to -100° C., and four domestic models priced from 49½ to 99 gns.

Microcell Ltd. emphasise in their display, the extremely wide potential application of Plasticell in the refrigeration, air-conditioning and allied industries. Plasticell is a constructional, insulating and reinforcing material manufactured from expanded polyvinyl chloride (PVC).

Exhibits show this material used as an interlayer in "sandwich" form in products where strength and rigidity are essential features. Available in densities ranging from 2.5 to 6.25-lb per cubic foot, Plasticell does not support combustion, is resistant to chemical attack, has excellent thermal (K factor approximately 0.2 B.t.u./in./h/sq. ft. degrees F) and electrical properties, and is extremely resistant to ageing. One-hundred-per-cent. closed-cell construction gives this material unique characteristics compared with other plastic foams—including superior moisture and gas vapour permeability resistance, a built-in vapour seal, and exceptionally high mechanical strength.

Microcell exhibits, designed to show various Plasticell applications include a plastic super freezer cold store door, a 36-can ice cream container, a section of an 8-ft. high



A container being assembled with an interlayer of Plasticell panels.

cold store, flip-flap lids for ice cream dispensers and transportable insulated containers. There is also a selection of sandwich panels in PVC, glass resin, aluminium, lam-

REFRIGERATION EXHIBITION

inated plastics and wood veneers, dash board panels for the motor industry, and sections of air-conditioning ducting.

Newalls Insulation Co. Ltd. are displaying a full range of materials such as cork, polystyrene, polyurethane, foamed glass, mineral wool, super glassfibre and expanded rubber. A new development is a range of rigid polyurethane pipe sections. This very light material has high structural strength and a very low thermal conductivity of 0.15 B.t.u. in per ft² h °F. and is suitable for all types of low temperature piping application. Erection is very rapid by conventional mechanical methods or adhesion and most of the usual finishing materials can be used. Newalls are now engaged on contracts using polyurethane foams which may be foam dispensed or poured as a liquid mix into cavities of complex design or difficult of access. The liquid, expanding as it foams, follows the contour of the cavity walls, ensuring an intimate contact and good adhesion between the insulant and the shell. These rigid foams are most effective in refrigerated ships and land cold stores where high structural strength, low density and water absorption, together with low thermal conductivity are all important factors in the choice of a suitable insulating medium. Spraying techniques have also been developed using special machines for the covering of tanks, vessels, etc.

Also on exhibition is a range of Newalls super glassfibre materials including resin-bonded slabs and sections, loose wool, mattresses, etc. Various types of finishes are displayed, as well as photographs of outstanding contracts completed by the company.

Perfection Parts Ltd., are exhibiting the following items:

(i) Line fittings including all the popular flare nuts, unions, elbows, tees, etc., and also the Herion heat-exchangers and the latest type individually packed Wolverine copper tubing.

(ii) Controls of all descriptions including expansion valves, solenoid valves, pressure regulators, water regulators and all types of temperature and pressure operated switches. This section will include special exhibits of the products of such companies as Sporlan, Henry, Hubbell, Alco, Herion and Penn.

(iii) Service and installation tools

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of all descriptions including a complete range of the latest type Imperial tools.

(iv) Commercial cooling equipment including freezing plates or



Wolverine soft copper tube.

plate coils, evaporators, complete cooling units, shelves, trays, etc., The latest type Acme cooling towers and Worthington pumps.

(v) Refrigeration cabinet fittings including door gasket, hinges and fasteners, etc.

The refrigeration division of **Petters Ltd.** are showing five units, together with compressor and engine components, from the range of Thermo King refrigeration equipment manufactured under licence at

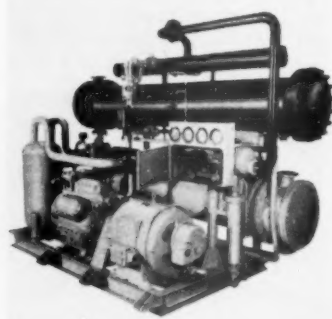


Thermo-King refrigeration unit designed for rigid trailer.

their Hamble factory. These will comprise: Model M20D, designed for rigid trucks and powered by an

engine and electric motor; model KL20, designed for trailers and powered by an engine and electric motor; model HM20 designed for rigid trucks and powered by a hydraulic and electric motor; model GA10 designed for small rigid trucks powered by an engine; model AM2 designed for bus air-conditioning powered by an engine. Each is a complete, self-contained, mechanical refrigeration unit, which can be installed in any type and size of vehicle. Correct temperature is thermostatically maintained for any length of time. Cooling is by forced circulation of air drawn from the cargo space through the cooling coil where heat is removed; cooled air is then blown back, over and around the cargo. By using warm air, the same principle can be adapted to prevent perishables from freezing in cold weather. The snap of a switch provides either service. The units are powered by a self-contained engine, by engine and electric motor, or by electric motor only—to suit particular requirements. Practically no payload space is occupied.

Alfred Porter have three principal exhibits. The first, a 20 tons R packaged water chiller (shell and tube direct expansion evaporator), incorporates a high speed direct coupled reciprocating compressor,



Alfred Porter packaged water chiller unit.

a shell and tube (extended surface) water cooled condenser, and a compressor fitted with three steps of capacity control, the mechanism being incorporated in the crank case and actuated by oil pressure the motivation being a diminution of load in the evaporator.

The system is designed for fluid chilling, and the apparatus is fully protected by: high/low safety pressure controls, water flow differential pressure switch, oil failure differential

pressure switch, low limit safety thermostat, and low limit (manual reset pressure control).

The second exhibit is a 50 tons R packaged water chilling plant (flooded operated shell and tube Evaporator), incorporating a high speed direct coupled reciprocating compressor, a shell and tube (extended surface) water cooled condenser, and a compressor fitted with three steps of capacity control, the mechanism being incorporated in the crank case and actuated by oil pressure the motivation being a diminution of load in the evaporator.

The system is designed for fluid chilling, and the apparatus is fully protected by: high/low safety pressure controls, water flow differential pressure switch, oil failure differential pressure switch, low limit safety thermostat, and low limit (manual reset low pressure control).

Exhibit number three is a model AC5H2 air cooled condenser. The particulars are: condenser duty 72,600 B.t.u./hr., air volume 4,300 c.f.m., fan arrangement 30 in. dia. by 6 blade cast aluminium construction driven by 2 speed motor 1405/695 r.p.m., through Vee belt arrangement. The assembly is fitted with a shutter assembly controlled by Honeywell Brown Modutrol motor to give capacity reduction on diminution of the system delivery pressure. Liquid receiver is fitted integrally in the frame assembly.

Refrigerator Components Ltd. As a result of the interest shown last year in the Charging Plant for sealed systems, Refrigeration Components Ltd. are exhibiting two new plants, as well as vacuum pumps. In addition, "Blizzard" forced convection evaporators are prominently featured, and a sectioned, as well as a demonstration model, shows the simplicity and effectiveness of the Autodefroster design.

The complete range of the R.C.L. packless valves from $\frac{1}{4}$ in. to $3\frac{1}{2}$ in. are also on show. Sectioned models displace the high degree of control which is obtainable from this design.

Ranco thermostatic and pressure controls are displayed, and Ranco's technical representative is in attendance to assist visitors with any control problems, as well as to demonstrate the new models. Trumpf cabinet furniture shows the variety of fittings which are obtainable through the interchangeability of parts.

Sharing a stand with Refrigeration Components Ltd. are F.A.S. who show their Expansion Valves—"the

valves with the interchangeable cartridges," without removing the valve from its line it is possible to change the orifice and other working parts.

The Temperature Regulator is also displayed; this is a valve modulated by a thermo-sensitive element. A full range of controls to suit almost every application is on display, and a staff of technicians is available to assist visitors with all problems concerning refrigerant control.

Refrigeration Spares Ltd., are displaying a wide range of home produced and imported equipment, including a variety of "Ranco" thermostats and controls, J. Samuel White frozen food and display cabinets, Teddington thermostats and controls, English Electric and B.T.H., motors and Sternette condensing units. Several imported products are also on show, amongst them "Imperial" refrigeration tools and accessories, "Kenmore" molecular sieve driers, and "Howard" fan motors. "The Martin Bitzer" condensing units and a panel showing working models of the "Flica" are also of interest. The Klockner-Moeller range of thermostats suitable for domestic refrigerator and frozen food cabinets are claimed to give life service (*i.e.*, 500,000 switchings).

A new company, Refrigeration Spares (Manchester) Ltd., has been formed to serve refrigeration dealers and manufacturers in the Midlands, North of England, Northern Ireland, Eire and Scotland.

Regis Refrigeration are exhibiting the two range of frozen food merchandisers and medium temperature cabinets from Sweden. The frozen food merchandisers range includes machines from 8 c.ft. to 24 c.ft. capacity, with two automatic de-frosting models of 11.8 c.ft. and 15.4 c.ft. capacity.

The two Master 100 glass-fronted medium temperature cabinet with under-storage accessible from the rear has been especially designed for the butcher. It is 6 ft. 4 in. in length, and all fittings are in stainless steel including a set of trays.

The Sherer Model 4908 red meat merchandisers incorporates the latest in American design for the display of prepacked meat. It is 8 ft. in length and is fitted with automatic de-frosting, and provides 20 sq. ft. display area.

Rootes Tempair of Maitstone are exhibiting a completely new cellar cooler, designed for cooling wine and beer. This pint sized unit (27½ in.

high, 20½ in. long and 14½ in. deep) is water cooled and needs no access to the open air. Designed to maintain temperatures at between 50° and 60° F., it costs little to install for it can stand on floor or shelf or be hung from a wall, ceiling or rafters.

Apart from the applications mentioned above, this cooler can also be used for the overnight storage of fruit and vegetables, for the conditioning of cold storage of furs and for lightening the service loads on cold stores and refrigerators. The unit has a nett cooling capacity of 12,000 B.t.u per hour, an evaporator airflow of 700 C.F.M. and an evaporating range of 35° F. It is finished in white stove enamel and filters are available at no extra cost for use when the air is dust-laden. The price is £140.

Another new Tempair product, the Director, is also on show. This is a luxury air-conditioner, designed for boardrooms, hotel suites, reception rooms, etc. It is finished in beige, old oak and silver to blend with traditional and modern décor. The cabinet is lined with sound baffling material throughout.

The Director measures less than 3 ft. high and 3 ft. wide and its installation requires neither wall nor window breaching. It is available either water cooled or air cooled and has a moisture removal capacity of five pints an hour. Its evaporator airflow works at the rate of 420 C.F.M. and its heating unit has a capacity of 3 Kw. The price of the water cooled unit is £210 and the air cooled unit costs £265.

David Scott will be showing the following exhibits of interest to the refrigeration industry:—sova-bead rechargeable driers, molecular sieve driers, tube and wire condensers, compressor stop valves, packless line valves, accumulator driers, accumulators, jug filling valves, drinking water valves, liquid line indicators, "freon" cylinder valves, CO₂ cylinder valves, CO₂ converter valves.

The **Sterne** exhibit consists of the complete range of their hermetic equipment, from 1/12th to 2 h.p. Of particular interest is the new AM compressor which is equivalent to some of the larger models of the well-known "Pancake" series. Another new model on show is the AT compressor which offers an alternative to the ½ h.p. single-cylinder compressor. On show for the first time from the Crown ironworks is the 4 h.p. air-cooled hermetic unit. Other industrial exhibits are the 4S

REFRIGERATION EXHIBITION

semi-hermetic compressor and a 6VP machine.

The highlight of the stand, is the new Sterne film "Cold Comfort," which shows the production methods used at the hermetic unit division. This is a colour film with sound commentary and is on continuous show.

Stewart King Industries are exhibiting a comprehensive range of packaged air conditioning units and refrigeration plant comprising the following items:—

The Air King Super 150, 1½ h.p. Temperature Control Unit, which gives accurate control of temperature and de-humidification for industrial applications and is complete with control panel, special set thermostat and humidistat.

The Air King Super 150 1½ h.p. Air-Conditioning Unit, is suitable for all types of air-conditioning requirements.

The Air King Safeguard Unit, is specially designed for operating in dangerous areas and can be supplied with "intrinsically safe" controls.

The New Air King Air-Conditioning Unit ¾ and 1 h.p., suitable for general air-conditioning and temperature control applications.

The Air King Console Unit, with oak or mahogany veneer case particularly suitable for office and board room applications, in two models of 1½ and 2 h.p. This machine is extremely quiet in operation and lends itself to dealing with the most exacting requirements.

The Air King Beer Cellar Temperature Controller, is available as a water cooled unit and is complete in every detail with the choice of trolley or substantial wall bracket mounting. It cools in summer and heats in winter by automatic control.

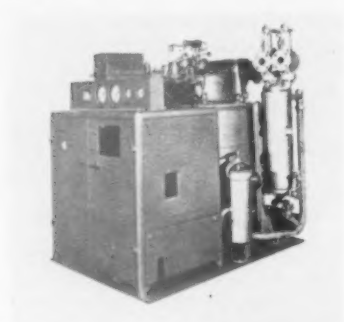
The Air King Water Chilling Plant, which has a capacity of 5 tons, is made in a variety of sizes to meet customers requirements.

The Air King Air Filtration Unit, made in two models, for bringing in fresh air from an outside source and also for internal suspension for re-circulating filtration. These units can be fitted with high duty filters for filtration in the 0.5 to 1.0 micron range or alternatively with medium duty filters in the five micron range. They have been specially designed for use in clean areas, and are also in demand for office applications.

Air King Air Handling Unit, designed for wall or suspended fixing. The model exhibited has a capacity of 2 tons.

REFRIGERATION EXHIBITION

The J. Stone & Co. (Deptford) Ltd. exhibits are devoted to refrigeration equipment for road vehicles, and packaged steam-raising equipment. The refrigeration equipment is of Stone-Carrier design, and is the outcome of collaboration between Stone's and the Carrier Corporation. Two similar equipments, suitable for rail or road vehicle refrigeration, are displayed, one static and the other operating a test chamber. Each consists of two self-contained units, a condensing unit and a cooler unit, capable of obtaining interior temperatures



Unit for Stone's packaged steam-raising equipment.

suitable for all frozen goods in suitably insulated vehicles of 30 ft. length at ambient temperatures of up to 100° F.

The condensing unit is usually externally mounted. It embodies the prime mover, a Perkins 4/99 engine which, through an automatic clutch, direct drives the compressor. An electrical control panel is included and all interior pipework and electrical connections are contained within a resiliently mounted framework. The cooler unit, internally mounted, contains numerous finned coils to provide maximum cooling in the smallest possible space, and two separate motorised fans to provide the necessary circulation of air.

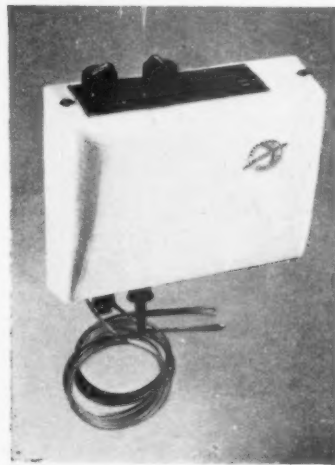
The packaged boiler also displayed is a Stone-Vapor model OK. 4616. It has a capacity of 2,105 lb. steam per hour from and at 212° F., and occupies a floor space of only 5 ft. 6 in. by 3 ft. 9 in. approx. Its height is about 5 ft. 5 in.

Stone-Vapor Boilers are oil-fired, forced circulation water tube boilers that provide, in single or multiple installations, an automatically modulating output that closely follows the steam demand. Fully self-

contained and easy to install, they are a fraction of the size and weight of conventional boilers of the same rating. Steam is raised in two minutes from a cold start, and thereafter produced only when required. Constant supervision is not necessary. Owing to the modulating output, there is no wasted fuel or water. Other important advantages include easy, speedy installation; smoke-free combustion; the ability to cope with peak and minimum loads at the same high efficiency; and simple operation and maintenance. Stone-Vapor boilers can be positioned with advantage wherever required and at any level—even on the roof.

Teddington Refrigeration Controls Ltd. are showing a full range of instruments, including several new introductions. Among the range are thermostatic expansion valves of all types, including the RD which has no capillary and phial, control being achieved by passing the suction line directly through the valve head; this gives sensitive and accurate control.

There is a selection of thermostatic switches for domestic, commercial and general refrigeration use, such as the QR, a wall-mounting thermostat with fine differential



A Teddington RD thermostatic valve.

suitable for deep-freeze cabinets, milk coolers, etc., up to 1 h.p., and the QJ in many ranges, for cabinet use. The KCA "Thinline" is of interest, being small enough to allow fitting in domestic cabinet liners.

Other items are pressure controls, thermometers, filter driers, gas valves, shaft seals, water valves, etc.

New products include the "Flolyn" thermostatic expansion valve, dual temperature audible alarm, and KDA thermometer. A section of the stand is devoted to air-conditioning controls.

There are three basic models of the "Temkon" series "N" room air-conditioner—the N.468 three-phase, the N.422 single-phase and the N.303 single-phase. These units are supplied with either air-cooled or water-cooled condensers and are available for cooling only or cooling plus heat pump or cooling plus electric heating. These conditioners are extremely versatile, being designed for either wall or window mounting and for normal room use and ducted applications. They are constructed of double stove enamelled, pre-treated, zinc-coated steel to resist rusting in saliferous tropical climates and the exposed rear grille is plastic dipped to prevent corrosion. Multi-positioned type air grilles provide directional air control and a metal fascia can be fitted to connect with ducting for remote installation. The units can be remote controlled and are fully tested to operate in ambient temperatures of 120° F.

Also on display is the NMT plant for cold store applications between 35° and 50° F. and the new "P" water-cooled slimline room air-conditioner.

Amongst the items shown by **Temperature Ltd.** is a working model of the "Whispair" floor-mounted room air-conditioner—the latest addition to their range of temperature "packaged" air-conditioners, especially designed for installation in commercial premises. Height is 30 in., width 33 in., and it is finished in two tones. It can be fitted to any outside wall over 3 in. thick (the vent is only 32 in. by 16½ in.) and does not project beyond the building line. The pre-eminent feature of the "Whispair" is its silence, ensured by absorbent acoustic insulation and a twin-drum circulation fan assembly. Air- or water-cooled models are available; six, four-way adjustable grilles give draughtless air distribution through 360° and a thermostatically controlled 2-kW. heating element is fitted for use when required. The "Whispair" has a nominal capacity of one ton refrigeration (12,000 B.t.u. per hour) at maximum tropical conditions.

Several other Temperature products are displayed.

The "Temkon" beer cellar cooler is a self-contained electrically powered unit for use in ambient temperatures up to 90° F. A thermostat

keeps cellar temperatures at any required level between 50° and 60° F. Water- or air-cooled models, of 1½ and 2 h.p. are available. The refrigeration system is hermetically sealed and refrigerant control is by capillary tube, ensuring minimum attention once the unit is installed. The "Temkon" unit also features automatic defrosting.

The "Temkon" low-temperature cooler is designed for static cold store applications in ambient temperatures of 90° F. and below. Temperature range (controlled by an adjustable thermostat) is 15° to 38° F. for the air-cooled model and -5° to 38° F. for the water-cooled. Defrosting is automatically controlled by a separate in-built thermostat and normally takes less than 5 minutes. The cooler is mounted through the wall and only protrudes 10½ in. into the cold room. The measurements of the unit are 30½ in. wide by 17½ in. high by 28½ in. deep.

Thermo Plastics Ltd., are displaying domestic refrigerator doors and cabinet interiors, moulded from high impact polystyrene, and rigid P.V.C. in white and pastel shades, together with commercial refrigerator tops in the same material and smaller ancillary components.

Also on show are various new injection moulded components made from high impact polystyrene, polythene, urea, nylon and various other injection moulding materials. The type of insulated container being exhibited is currently being produced for T. Wall & Sons. The outside container is produced from glass reinforced material which gives it a superior impact strength whilst the insulating core is of expanded polystyrene.

The rapid progress made in the use of rigid polystyrene foam will be seen from the refrigerator door and cabinet liners being displayed. These are foamed after moulding. Polyurethane foam is exhibited in this instance as insulating panelling and this can be manufactured in either slab or brick form. In addition to the foamed insulating panelling, a range of flat glass reinforced sheeting is shown. This type of sheeting is now finding an increasing application for the lining of cold rooms and refrigerator stores. It has an attractive appearance, extremely good impact strength, and a very high hygienic standard.

Westgate Engineers Ltd., in conjunction with Gordon Sales & Service Co. Ltd., are showing a new type of high temperature display

cabinets, with additional refrigerated storage. These machines, ranging from 7 sq. ft. display area and 4.5 c.ft. storage capacity to 15 sq. ft. and 25 c.ft. respectively, are designed to form part of the shop and not just an additional item to be placed on an existing counter. They are finished in white stove enamel with polished stainless steel ends and kicking plate.

All frozen food cabinets being manufactured are fitted with quadruple glazed front units, heater circuits and illuminated sign. Again, zintec sheet steel only is used for panel work with three coats, baked



Westgate 6 ft. three-tiered wall cabinet.

enamel finish. An attractive feature of this range is that a false formica front panel is fitted in any one of the new "Sequin Series" and can be changed if the colour scheme of a shop is altered.

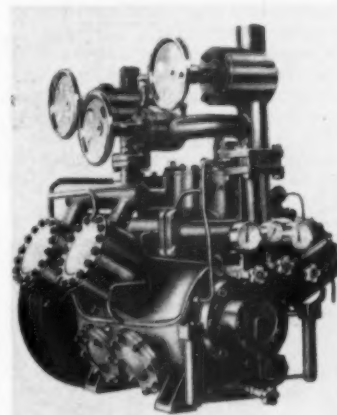
The first of a line of three-tiered wall display cabinets is also on view. Made in 6-ft. units, these cabinets are manufactured to display frozen food, butter, bacon, ham and also canned goods, etc. A 6-ft. unit comprises of 7 c.ft. frozen food, 10 sq. ft. high temperature and 6 sq. ft. of non-refrigerated shelving. Finished in white enamel with stainless steel end trims.

All cabinets manufactured by Westgate are fitted with Tecumseh condensing units and tests to British Standards specification carried out, prior to machines being issued from the factory.

G. Williams Engineering Co. Ltd., are showing a packaged freezer installation, as well as condensers, shell and tube and air-cooled units

REFRIGERATION EXHIBITION

of 80 tons nominal capacity. The Grasso range of compressors and ice cream plant is represented, and there are exhibits covering frozen food storage and shop bulk storage to large-scale sub zero stores.



Grasso 6-cylinder compressor.

The wide range application of the Winget-Dole vacuum holdover plates is illustrated by a number of products incorporating them. Amongst these are the following:—

The "Aquila" bottle cooler, manufactured by Messrs. Sharp & Law (Insulation) Ltd., is designed for making and storing ice cubes in addition to its primary function of bottle cooling. It incorporates a Winget-Dole dished plate containing holdover solution. The unit compartment is integral in construction and is fitted with grilles for air circulation. An hermetically sealed condensing unit is installed and the whole unit is finished in white plastic.

The "Hercules" holdover cabinet,



A 7 ft. Winget-Dole holdover tank.

REFRIGERATION EXHIBITION

also manufactured by Messrs. Sharp & Law (Insulation) Ltd., is used in vans and mobile shops for the sale of ice cream. The interior consists of a Winget-Dole holdover tank containing -12° F. holdover solution. A hinged top gives easy access for loading and the "flip-flap" lids are employed for vending purposes. A hermetic system is incorporated in the unit cabinet. The whole is finished in white stove enamel with polished aluminium corner trims. The full range of "Hercules" cabinets includes models designed to hold both package and bulk ice cream.

The "Carrirefreeze" insulated refrigerated cabinet is manufactured by Messrs. Smith's Delivery Vehicles. It is specially designed by Smith's for their mobile shops but can be fitted into any existing vehicle. Completely self-contained, it gives easy access and can store large quantities of perishable foods such as meat, fish, fats, provisions, etc. Refrigeration is obtained by a Winget-Dole holdover plate which serves two compartments each containing four detachable and adjustable food trays. The whole is finished in aluminium.

The Winget "Snowdrift" coolant display unit, the latest edition of the Winget refrigerated display unit, incorporates a Winget-Dole "L"-shaped plate with a new white finish which adds greatly to its attractive and hygienic appearance. Designed

for counters and windows it enables the widest selection of perishables to be displayed in perfect safety for long periods. Finished in black and white plastic, the unit is available in a number of sizes.

A half-scale model of the Winget-Dole Truck-Cel is also on display. This eutectic blower unit for refrigerated transport combines the advantages of forced-air circulation and holdover and will maintain uniform temperatures (34° to 40° F.) on short or long hauls. It is exceptionally easy to install and is available in two types. Type PHO, or partial holdover, is for use with a vehicle condensing unit and type CHO or complete holdover is for use when the condensing unit can only be operated at night in the depot. A number of

sizes of both types are available.

A model of an Atlas Mark 1A accelerated freeze drying installation is also on display, as well as a selection of Winget-Dole plates for static and transport use together with a 7-ft. Winget-Dole holdover tank.

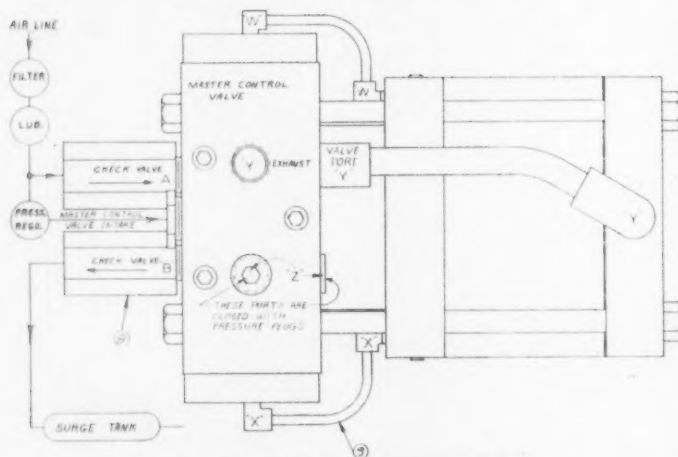
Zero Electric Ltd. share a stand with Messrs. Contardo of Milan and Messrs. Egelhof of Stuttgart. They are also displaying products of the following manufacturers: London Fan & Motor Co. Ltd.—Breeze and Trogan fans; Wilmot Breeden Ltd.—cabinet hardware; Genevac Ltd.—evacuation and charging unit designed specifically for the refrigeration engineer; Evomastics Ltd.—sealing compounds and manual

and pressure operated application guns; Armstrong Cork Co. Ltd.—Armaflex insulation; Wednesbury Tube Co. Ltd.—refrigeration quality copper tubing; Ranco Ltd.—thermostats and pressure switches. A fully comprehensive range of cold-room hardware, line fittings, service tools is also on display.

Zero Electric are displaying a wide range of products from several manufacturers.



Automatic Air Booster



Lynair automatic air to air booster with valves.

The Lynair automatic air booster is designed to boost air-line pressure automatically in surge tanks or die cushions. To operate this booster, air-line pressure is piped to the master control valve and to the intake side of the booster. The booster will then operate automatically to boost pressure in the die cushion or surge tank in the desired ratio.

The booster can be furnished in varying ratio: from 100 to 400 p.s.i.

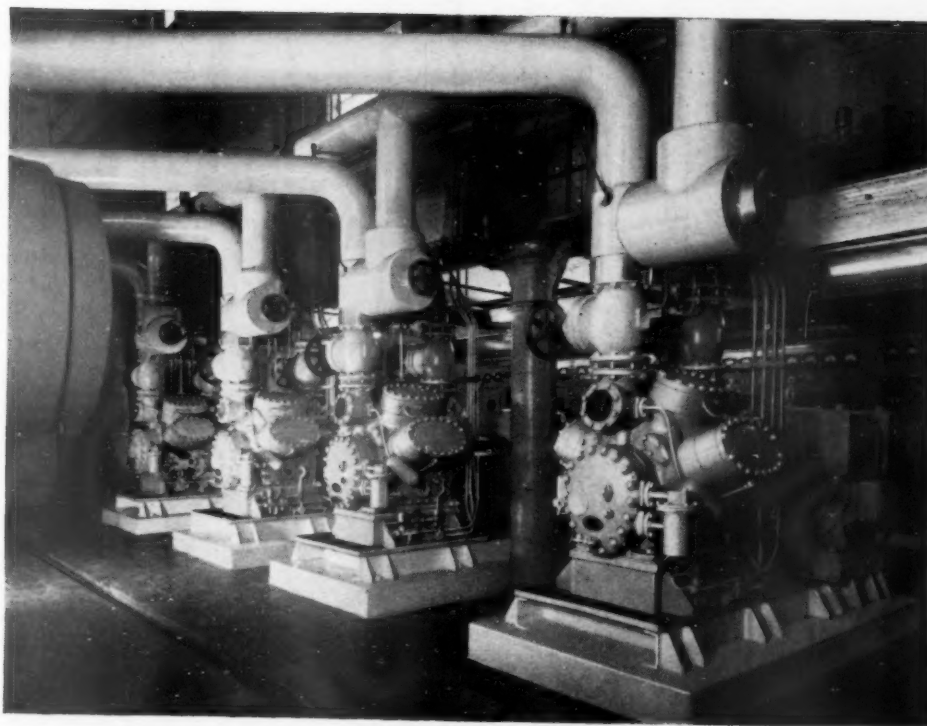
This booster is especially suitable for work where commercial refrigeration units have to be tested under water at high pressures. The booster is easily moved from one location to another and is very economical to operate. A pressure regulator, filter, and lubricator is furnished with all Lynair air boosters.

Referring to drawing 1 air-line pressure is piped through a filter, lubricator and check valve (A) to the high pressure end of the booster; there is thus always full air-line pressure against the high pressure piston. Air-line pressure is also piped through the same filter, lubricator and then through a pressure regulator to the intake of the master control valve.

Lynair uses the master control valve as a three-way valve cylinder and exhaust parts (Z) are closed with pressure plugs and serve no purpose in the operation of the booster.

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In brewing, for example, it plays a controlling part in all the processes. The illustration shows the four, 8-cylinder, 5" x 4" veebloc compressors, using ammonia as a refrigerant, supplied to Mann, Crossman & Paulin Ltd., Albion Brewery, London, E.C.1.

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NATIONAL COLLEGE EVENING COURSE

The National College for Heating, Ventilating, Refrigeration and Fan Engineering, Borough Road, announce a course of 10 evening lectures to be held on Tuesday evenings, commencing on April 11 at 6.30 p.m. The course will be suitable for those engaged in the design, specification and manufacture of refrigeration and air-conditioning equipment and should be of interest to refrigeration engineers, air-conditioning engineers and those engaged in industry on process cooling. Engineers and scientists with a general interest in heat and mass transfer will also profit from the lectures. Students should be graduates in science or engineering, or possess other suitable qualifications and experience. It is essential that students should already have at least an elementary knowledge of heat transfer. The matters to be discussed include: Heat flow through cold store walls and floors including transient effects in "pull down." A review of research conducted at the National College in recent years on heat and mass transfer topics of refrigeration and air-conditioning. The significance of this research for industry. "A review of international research on certain topics connected with evaporation and condensation." "Methods for the design and cooling coils, condensers, evaporators."

SLOW START FOR DOMESTIC REFRIGERATORS IN 1961

Demand for domestic refrigerators has started slowly this year, according to the January figures just issued by the Domestic Refrigeration Development Committee. Manufacturer's deliveries of domestic refrigerators to the home market during January totalled 43,144—a drop of 46.5 per cent. on January of last year, when deliveries reached 80,685. Exports have maintained a satisfactory increase. Deliveries in January to overseas markets were 10,870, an increase of 58.6 per cent. on January, 1960, when exports of domestic refrigerators by British manufacturers totalled 6,852.

Electrical traders in Camberley, Surrey, have accused Camberley Urban District Council of entering into competition with them. The Council seeks Ministry of Housing permission to borrow £21,807 to install 650 Electrolux refrigerators in

Council houses. The traders have written to Mr. K. S. Harvey, Clerk to the Council, protesting against the refrigerator scheme and asking the Council to receive a deputation. Camberley Chamber of Trade strongly backs the electrical traders and is also protesting to the Council. Sheffield Corporation deferred a similar scheme recently because the Corporation had not realized it was breaking obligations imposed under a statutory order issued by the Government.

DOMESTIC APPLIANCES IN THE OXFORD AND SWINDON AREAS

In Oxford and the surrounding area 74 per cent. of the population have television sets in their homes whereas only 26 per cent. have refrigerators. These are among figures on the ownership of domestic appliances and electrical goods which emerge from two readership surveys just published for advertisers by Westminster Press Provincial Newspapers Ltd. The adult population of the area covered by the Oxford survey is approximately 277,000.

M.E.C. (Refrigeration) Ltd., suppliers of Levin and Eldwood refrigerators, have now been appointed authorised main dealers for Carlyle Air Conditioning & Refrigeration Ltd. Carlyle products are manufactured in the United Kingdom utilizing the patents and techniques of Carrier Corporation, U.S.A.

REFRIGERATION SPARES IN THE NORTH

A company has been formed under the name of Refrigeration Spares (Manchester) Ltd. to establish a wholesale refrigeration business to serve the midlands, north of England, northern Ireland, Eire and Scotland. Premises at Milltown Street, Radcliffe, Manchester, carrying a comprehensive stock of refrigeration components, condensing units, controls and J. Samuel White display cabinets, were opened last month. The directors are Mr. R. Allen, of J. Samuel White & Co. Ltd., and Mr. A. Cherrill, of Refrigeration Spares Ltd. The secretary is Mr. R. T. Cole. The Manchester company will be closely associated with Refrigeration Spares Ltd., of Leytonstone, who will handle all business south of Birmingham. The new arrangements are planned to give a nationwide service to refrigeration dealers and manufacturers.

Smith's Delivery Vehicles Limited of Gateshead-on-Tyne announce an important extension of their services to the food trades. In addition to their comprehensive range of mobile shops, the company have now taken over the manufacture and sale of the Litex Range of refrigerated vehicles, hitherto marketed by Walkers and County Cars Ltd. of Fleet. The Litex Range includes insulated and refrigerated bodies, and refrigerated containers, as well as the "Market Loader."



Cold Store and Frozen Foods Executives visit U.S.A. Mr. B. T. Smith, managing director of Smith Insulations Ltd., and Mr. A. E. Morphew, of Bird's Eye Foods Ltd., on arrival at Seattle Airport recently before starting their fourteen-day coast-to-coast tour of cold store installations throughout America.

THE SIMON MEMORIAL LECTURE

SUPERFLUID HELIUM*

By H. LONDON

Atomic Energy Research Establishment
Harwell

I HAVE been asked to give a lecture describing an aspect of the work for which this prize was awarded.†

Unfortunately, most of this work was done a long time ago and has since been repeated and improved by others, so that it would be tedious to speak about it in detail.

I think it will be more interesting to give a historical account of how our ideas on superfluid helium have developed, and to give to my own contributions to this subject somewhat more space than they would otherwise deserve.

This seems to be an appropriate theme for a Simon Memorial Lecture as Simon was one of the first who saw the unique role which liquid helium plays in low-temperature physics owing to its high zero-point energy and owing to the fact that it remains liquid down to absolute zero.

Thus, liquid helium was always foremost in his interest and his own contributions, and perhaps even more so the inspiration he gave to those around him, have been of decisive importance for our understanding of the superfluid.

In 1923 there was not yet any direct evidence for the existence of the zero-point energy.

In a paper with Bennewitz (Bennewitz and Simon 1923), Simon was able to give this evidence and to deduce the value of the zero-point energy of some liquefied gases by analysing their deviations from Trouton's rule and from the Lindemann melting formula.

For liquid helium he obtained a very high zero-point energy compared with its latent heat of evaporation, and he pointed out that the unusually large molecular volume of liquid helium, and the fact that it does not solidify, must be attributed to the large zero-point movement of the atoms.

In 1926 Keesom succeeded in solidifying helium by applying pressure and found that the melting pressure curve becomes horizontal at low temperatures.

This has the consequence that at low temperatures the entropy difference between liquid and solid disappears, in accordance with the third law of thermodynamics. But a liquid with zero entropy presented a great problem, because in a liquid the atoms are not orderly arranged and disorder means entropy.

This had been shown very clearly by Simon and Lange (1926) in their study of the entropy of amorphous substances. Measurements of the specific heat of glycerol had shown that amorphous glycerol has a higher entropy than crystalline glycerol and this

was attributed to its disorderly structure. Simon resolved the apparent contradiction with the third law by pointing out that such substances are not in *internal thermodynamic equilibrium* and cannot therefore be treated thermodynamically.

Now, here in liquid helium, there was apparently a similar configuration which *had* zero entropy. The nature of this ordered liquid state, which Simon called liquid degeneracy, was one of the great questions which preoccupied him in the following years during which the many other peculiar properties of liquid He were discovered.

At the time when the melting curve of helium was established the only other unusual property of liquid helium was the density maximum at 2.19 K Kamerlingh Onnes and Boks (1924). But one had the impression that other strange things were happening below this temperature. Measurements of the specific heat became irreproducible, vessels which were quite vacuum-tight at higher temperatures developed mysterious leaks.

In 1928 Keesom and Wolfke suggested that below 2.19°K helium changes into a different state which they called liquid He II.

In 1932 Keesom and Clusins discovered the discontinuity of the specific heat. After the shape of the curve they called this the λ -phenomenon and the temperature where the specific heat has a discontinuity, the λ -point. From the specific heat curve it could be seen that the ordering process sets in quite suddenly at the λ -point and most of the entropy is gone at 1°K.

In 1935 calorimetric measurements both in Leyden (Keesom and Keesom 1935) and at the Clarendon Laboratory (Rollin 1936) gave the first indications of the high thermal conductivity of He II. Soon direct measurements by Keesom and Keesom (1936) showed that the conductivity can be several million times higher than in He I.

Events came to a climax in 1938. The thermal conductivity was measured in more detail by Keesom and Saris (1938). They found that it has a maximum somewhere about 1.9°K, and that it depends on the temperature gradient. At low temperature gradients extremely high values of thermal conductivity were found.

Viscosity measurements had given conflicting results. These were now sorted out.

Measurements with an oscillating disc by Keesom and McWood (1938) and by Keesom and Keesom (1941) showed that, as distinct from all other liquids, the viscosity decreased with falling temperature, even in He I. In He II the decrease became somewhat steeper but not in a spectacular fashion, and there was no discontinuity at the λ -point. When, on the other hand, the viscosity was measured by the rate of flow through narrow capillaries (Allen and Misener 1938),

*Lecture delivered before the Low Temperature Group of the Society on October 13, 1959.

†The Simon Memorial Lecture has been instituted with the Simon Memorial Prize by the Low Temperature Group of the Physical Society in memory of Sir Francis Simon, who was largely instrumental in the formation of the group.

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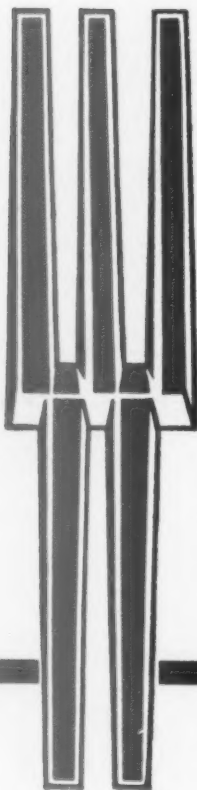
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or through narrow slits (Kapitza 1938), extremely low viscosity was found. This type of flow sets in discontinuously at the λ -point and, as with thermal conduction, the flow resistance becomes particularly low at low pressure-heads. With the narrowest channels Allen and Misener (1939) found that there was a critical flow rate, below which there was practically no flow resistance at all. This behaviour was called superfluidity.

The existence of a highly mobile film which creeps upwards along the wall of a tube at a fixed rate had been deduced two years earlier by Kurti, Rollin and Simon (1936) from calorimetric experiments by a feat of scientific detective work.

It was now demonstrated directly by Daunt and Mendelssohn (1938) and by Kikoin and Lazarew (1938).

The film has a critical transfer rate at which it flows independently of pressure-head or height above the liquid surface. Below this rate the flow resistance is zero.

The most startling discovery was, of course, the fountain effect. It was discussed at the beginning of that memorable year by Allen and Jones (1938). They found that if two vessels containing He II communicate through a narrow capillary and heat is supplied to one of the vessels, then helium flows towards the heated vessel until a certain level difference is established.

In order to explain the high thermal conductivity the idea had been put forward that for some reason the atoms in superfluid helium have a very long mean free path. With the values of thermal conductivity observed this would give a mean free path of several millimetres.

Thus helium might behave like a Knudsen gas. At the same time the density of liquid helium is very much higher than that of a rarified gas. So one might expect an easily detectable effect in a Knudsen manometer. I decided to test the idea (H. London 1938) and I built an extremely crude Knudsen gauge. It consisted simply of a small heatable plate in front of which a thin vane was suspended on two threads at a distance of about one millimetre. This distance could be read by looking from outside the Dewar vessel at a scale which was attached to the plate. The result was quite unexpected.

Up to a heater power of 13 mw cm⁻² no repulsion was observed in liquid He II, though at this rate 1/50 of the expected force should have been easily detected.

When the heater power was further increased, to my surprise, the vane was not repelled but attracted.

The year 1938 also brought the first x-ray structure pictures of liquid helium by Keesom and Taconis. For both liquid helium I and II a pattern typical for a liquid was found. It showed a single, rather diffuse, ring. No difference between the patterns of He I and He II could be discerned. Keesom and Taconis proposed a structure which can be visualized as a closest packed cubic lattice in which half the atoms have been removed, leaving only six nearest neighbours instead of the original 12.

I must now go back and talk about the development of the theory, which also took a decisive turn in 1938.

In the preceding years, my late brother, Fritz London, who had spent the years 1933 to 1936 at the Clarendon Laboratory, had made calculations on the structure of liquid and solid helium to put Simon's ideas on the effects of the zero-point energy on a quantitative basis (F. London 1936).

He calculated the potential energy from the known interaction of two helium atoms and took account of the zero-point energy by considering the case of force-free hard molecules of given diameter confined to a given volume. Trying various lattice arrangements, he found that the diamond lattice gave the lowest total energy at zero pressure and a value for energy and volume which agreed well with experiments.

The molar volume is about $2\frac{1}{2}$ times the volume which would result from the minimum of potential energy of a close-packed lattice.

At the actual large volume a more open lattice like the diamond has a lower potential energy and is therefore preferred.

The lattice deduced by Keesom and Taconis two years later from the x-ray pattern is also of the open type and gives similar volumes and energies.

Just as the Keesom-Taconis lattice is derived from a face-centred cubic lattice by leaving half the positions empty, so the diamond lattice is derived from the body-centred cubic lattice. Both the occupied and the empty places are surrounded by four occupied places at the same distance.

This led Fröhlich in 1937 to the suggestion that the λ -pheno-

menon might be an order-disorder transition similar to that occurring in β -brass.

This meant that above the λ -point N helium atoms are distributed at random over the $2N$ positions of the cubic lattice, while below the λ -point they settle down in the N places of one of the diamond sub-lattices. This gives about the right entropy change and a discontinuity of the specific heat.

Analysing Fröhlich's suggestion, my brother observed (F. London 1938) that the empty places are actually energetically lower than the occupied places because, in addition to the four nearest neighbours, they have also six next-nearest neighbours which the occupied places have not.

Therefore, at absolute zero one should expect an even occupation of the $2N$ sites of the cubic lattice, each occupied with the quantum mechanical expectation one half.

Quantum mechanical expectation is different from statistical probability. In the ground state the particle is described by a single wave function which indicates with what probability one can expect to find the particle at a given place.

According to the principles of quantum theory this is a complete and unique description of the particle. The statistics apply to the wave functions, not to the particle, and if there is only one single wave function there is no possibility of fluctuation or disorder; the probability is one, the entropy is zero.

Above the ground state there is a multitude of excited states which can become occupied at higher temperatures. In these excited states the particles can be more sharply localized and it is now possible to say that an atom belongs to the one, or to the other, sub-lattice. Which of the many wave functions is realized is a question of statistics. The number of all the possible arrangements is a measure of the disorder and directly related to the entropy.

Thus Fröhlich's order-disorder argument can still be maintained. Only the state of order is not one in which the N atoms settle down in N fully occupied sites; instead they settle down in $2N$ half-occupied sites.

Here we have the first example which shows how a random distribution can change into an ordered distribution on quantum mechanical principles.

However, having gone so far, my brother went further. If helium atoms can be at two places at the same time, then they are no longer tied to a definite lattice and must be able to move about.

The notion of a rigid lattice, which had never been taken seriously, was given up. This led my brother to a model in which each helium atom moves nearly freely in the self-consistent field of the other atoms in a similar way as electrons move in a metal according to Bloch's theory, but with the difference that the helium atoms obey Bose-Einstein statistics.

As a first step he disregarded the self-consistent field altogether—as Sommerfeld had done with the free electron gas—and considered the ideal Bose-Einstein gas. Einstein had mentioned in 1925, in a paper on the degeneracy of an ideal gas, a peculiar condensation phenomenon. Below a certain temperature, which depends on the mass and density of the particles, a finite fraction of them begins to collect in the lowest energy state, that is, they assume zero momentum. (This fraction increases as the temperature is lowered, until at absolute zero all particles are in the lowest state). The remaining particles have a velocity distribution similar to a classical gas, flying about as individuals. As both groups of particles fill the whole available space, there is no condensation in the ordinary sense, that is, there is no separation in space into two phases which can be distinguished by their density. But if we consider the momentum space, i.e. if we plot the number of particles as function of their momentum, then we have two separate phases. So one speaks of condensation in momentum space.

The condensed particles with their sharply defined zero momentum are, according to the uncertainty principle, not localized. Each is everywhere. In quantum mechanics they are described by a single wave function which is symmetrical in all particles so that an exchange of two particles leaves the wave function unaltered.

Just as was the case with the distribution over two possible lattice positions, we have here a distribution over the whole volume which is described by a single wave function. Therefore we have zero entropy.

Thus the order assumed at absolute zero is an order in momentum space. In ordinary space there is no order, but also no disorder, the particles are just no longer localized.

For an ideal Bose-Einstein gas the onset of the condensation causes a kink in the specific heat curve (cf. figure 8). The condensation temperature calculated for the density and mass of liquid helium is 3.09° K. The actual λ -transition of liquid helium shows a discontinuity of the specific heat, not a kink, and takes place at 2.19° K, but, as my brother put it, "It seems difficult not to imagine a connection between the two."

At any rate, the Bose-Einstein gas model has given a clue to an understanding of many of the strange phenomena of liquid helium. This has become possible through the two-fluid concept which was proposed by Tisza (1938 a) on the basis of the ideal Bose-Einstein gas model. He saw that the two phases, mixed up in ordinary space as they were, still represent separate entities which are able to move independently. The two phases are called the superfluid and the normal phase.

He made the hypothesis that the superfluid phase has zero entropy, and that it does not take part in the dissipation of momentum. In narrow channels only the superfluid phase can move.

The atoms of the normal phase are assumed to behave like a gas, in particular, to have a gas-like viscosity with a positive temperature coefficient as had been found with the oscillating disc measurements.

The two phases have each a partial pressure. The two add up to the total pressure of the liquid. The partial pressure of the normal phase is assumed to be that of an ideal gas of the same concentration and temperature. It is likened to the osmotic pressure of a solution. A narrow capillary acts as a semi-permeable wall across which the partial pressure of the superfluid phase is equalized. If the two ends of the capillary are at different temperatures, then the partial pressure of the normal phase is different and, therefore, also the total pressure. This explains the fountain effect.

In his note to *Nature*, Tisza (1938a) also predicts the inverse effect, the evolution and absorption of heat at the points where helium II enters and leaves the capillary, and he also says that a high thermal conduction should result from the internal connections set up by a temperature gradient, but these effects are hinted at rather vaguely.

Tisza's paper became known while I was pondering over the strange result of my Knudsen gauge experiment. If convection currents are set up by temperature gradients, one might be able to explain the attraction of the vane by the Bernoulli force of liquid flowing along the vane. At that time it was not at all clear what shape this flow would take in wide channels. As the superfluid flow was particularly strong in narrow channels and the flow rate seemed to be proportional to the wall perimeter, the idea was current that the superfluid flow was localized at the solid walls and somehow promoted by temperature gradients along these walls. So I assumed that in my experiment the superfluid flows along the heater wall towards the sources of heat, turns here into ordinary flow which then flows outward according to the common laws of hydrodynamics. Had I read Tisza's paper more carefully, I would have assumed a volume flow for both phases, but I took from his paper only the statement that the superflow carries no entropy. Since the ordinary flow carries per cubic centimetre the entropy ρs , where ρ is the density and s the entropy per gram of helium, the volume flow rate V caused by a heat source Q must be given by $Q = V \rho s T$.

From this flow rate and from the geometry of the Knudsen gauge I could then calculate the velocity v and the Bernoulli force

$$f = \frac{1}{2} \rho v^2.$$

The observed force was actually 16 times higher, but considering the crudeness of the apparatus I was confident that the interpretation was essentially correct.

We know now that the superflow is not a surface flow but a volume flow. This makes the Bernoulli force

$$f = \frac{1}{2} \rho_n v_n^2 + \frac{1}{2} \rho_s v_s^2$$

where ρ_s and ρ_n are the partial densities of the two fluids and v_s and v_n their velocities, and the mass turnover at the heat source is

$$\rho v = \rho_s v_s = -\rho_n v_n.$$

This introduces a factor ρ/ρ_n into the relation between heat and Bernoulli force and gives a better agreement between theory and experiment.

These uncertainties regarding the hydrodynamics are irrelevant to the thermodynamics of the fountain effect (H. London 1939).

The fountain is by far the simplest heat engine and should become the text-book example of the second law. Consider two cylinders with pistons A and B which are connected by a superleak and filled with liquid helium. Let the temperatures be T and $T + dT$, then in equilibrium the pressures will differ by dp so the pressures on the pistons will be p and $p + dp$. If we transfer the volume V from A to B by moving the pistons, we gain the work $A = Vdp$, and this is derived from heat Q_B absorbed at B and Q_A evolved at A. According to the first law,

$$A = Vdp = Q_B - Q_A,$$

and according to the second law,

$$\frac{Q_B}{T + dT} = \frac{Q_A}{T},$$

$$\frac{Q_A}{T} = \sqrt{\frac{dp}{dT}}.$$

This gives

(1)

This relation is purely thermodynamical and requires only that the fountain effect is essentially a reversible phenomenon. It is called the mechanocaloric effect and was observed soon afterwards by Daunt and Mendelssohn (1939).

We now introduce Tisza's hypothesis that the liquid entering the capillary leaves its entropy behind:

$$\frac{Q_A}{T} = V \rho s. \quad (2)$$

Inserting this into equation (1) one obtains

$$\frac{dp}{dT} = \rho s, \quad (3)$$

which relates the fountain effect to the entropy of liquid helium.

These equations have since been verified experimentally in the entire temperature range from the λ -point down to 0.1° K.

They were derived on the assumption that the fountain effect is essentially a reversible phenomenon; in other words, that incidental irreversible effects can be made as small as desired. Such an irreversible effect is the viscous flow of normal fluid under the influence of the pressure difference dp . This flow carries heat to the low-temperature end. One can reduce the heat flow as much as desired by making the capillary long and narrow. In this respect the fountain effect differs from the thermoelectric effect with which it has otherwise great similarity. The superfluid flow encounters no resistance and is therefore not affected by lengthening of the capillary.

In thermoelectricity one has ohmic resistance and thermal conductivity and these are related to each other by the Wiedemann-Franz Law; and lengthening the wires which connect the hot and cold junctions, though reducing the heat flow, increases the Joule heat.

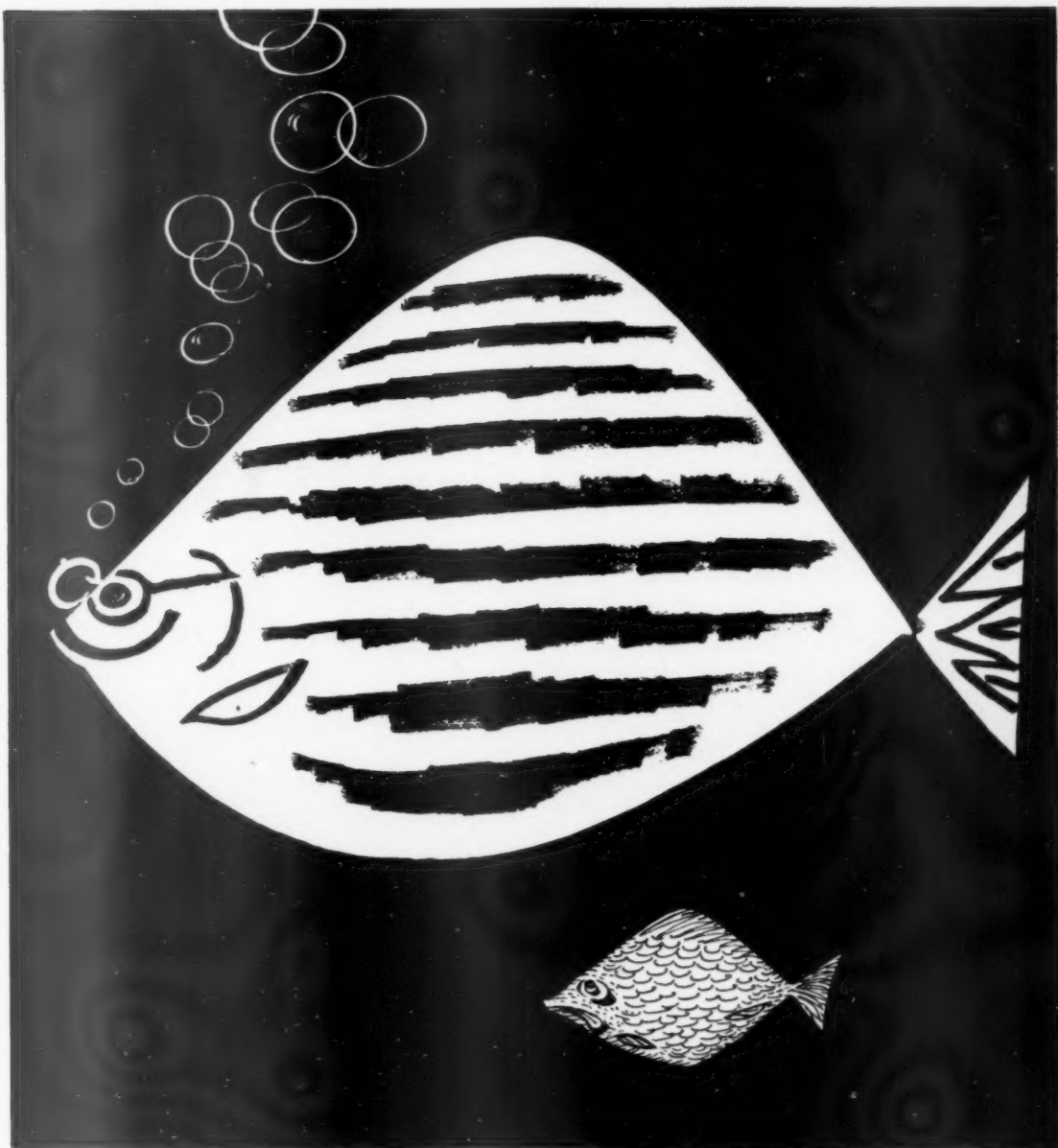
I therefore think it is not appropriate to introduce the thermodynamics of irreversible processes in order to derive the thermodynamic equations of the fountain effect as was done by de Groot (1951).

In not too narrow tubes the normal fluid flows in the direction of the temperature gradient, driven by the fountain pressure, while the superfluid moves in the opposite direction. The two types of flow are converted into each other at the heat sources and heat sinks, as discussed in connection with the Knudsen experiments.

This leads to a strong heat transport which is proportional to the temperature gradient, as long as the only flow resistance is that due to the viscosity of the normal fluid. At higher heat currents the superfluid also encounters a flow resistance and a new phenomenon enters, the mutual friction between the two fluids (Gorter and Mellink 1949); then the heat flow increases less than proportional to the temperature gradient. These details were properly understood only at a much later stage.

In wide channels the viscosity of the normal phase is so low that inertia effects predominate. This led Tisza (1938) to the prediction of "temperature waves" in which the two fluids carry out a relative motion with respect to each other, such that the partial densities of the two fluids oscillate but the total density stays constant. As a change in density of normal fluid corresponds to a change in temperature, Tisza called these waves "temperature waves." He published this at the end of 1938, but owing to the war this paper did not get the attention it deserved.

(to be continued)



Most companies start as small fish. But few plan to *stay* small. Most would like to grow into BIG fish given the chance. But growing takes money, and sad to say, not every small fish has quite as much money as he could wish. However, money is just what **UDT** *does* have. We supply money to help businesses expand, extend their premises, add new or replace old equipment. Do *you* dream of becoming a BIG fish? Perhaps **UDT** can help you grow.

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Literature and information are available on request.



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COMMERCIAL AND INDUSTRIAL SECTION

Manufacturers' and Distributors' News

Marking of Imported Cabinets.
The standing committee (general merchandise) set up under the Merchandise Marks Act, 1926, will hold a public inquiry at the Board of Trade Offices, Horse Guards Avenue, London, S.W.1, on Thursday, May 4, 1961, at 10.30 a.m. to consider whether imported goods of the following descriptions should be required to bear an indication of origin at the time of importation and sale and exposure for sale in the United Kingdom:—(a) Domestic refrigerator cabinets, whether or not incorporating a refrigerating system or part of such system; (b) Commercial refrigerator cabinets, whether or not incorporating a refrigerating system or part of such system, including deep freeze cabinets, display cabinets, frozen food cabinets, service cabinets, ice cream conservators, display counters and farm freezers. The Board of Trade announced on January 30, 1961, that they had been asked to recommend the making of an Order in Council under Section 2 of the Merchandise Marks Act, 1926 and had referred the request to the standing committee. Communications regarding the inquiry should be addressed to the secretary, Merchandise Marks Committee, Board of Trade, Horse Guards Avenue, London, S.W.1, as soon as possible (Telephone: TRAfalgar 8855, Extn. 2264).

Frigidaire Division of **General Motors Ltd.** announce the appointment of K. H. Vere to be executive assistant to the general sales manager, G. E. Worssam. Mr. Vere, who has been marketing manager for the past three years and prior to that was sales promotion and advertising manager for five years, is succeeded as marketing manager by D. V. Smith at present manager, business management department. R. F. Salter, at present advertising manager, becomes assistant market-



Mr. W. K. Bradley, general manager of the United Kingdom Special Products Division of Chrysler International, S.A. Mr. Bradley's Division is responsible for the marketing in the U.K. of Chrysler Airtemp refrigeration, air-conditioning and heating equipment.

The **Torotrelli Zero-Stand** Italian equipment, which **Dollar-ae, Ltd.**, of Glasgow, are importing as sole U.K. distributors, was shown at the Kelvin Hall, Glasgow, Dairy show, recently. The ice cream-making unit is located alongside the display cabinet, where various ice creams are shown, under glass, on open display. The unit is designed for small-scale production, and visual presentation, in cafés, restaurants and smaller units interested in producing their own ice cream.



This special display float, created by the Leicester Co-operative Society, A.E.I.-Hotpoint and the Milk Marketing Board, toured Leicester for the duration of a special competition.

ing manager, and D. A. Cole, now sales promotion manager, is appointed advertising manager. W. R. Seabrook, household sales manager,

moves to sales promotion manager. T. C. Fish is appointed appliance sales manager and E. E. Wratten assistant appliance manager.

COMMERCIAL & INDUSTRIAL

Chrysler Airtemp Refrigeration, air-conditioning and heating equipment is now available throughout Scotland for the first time. This news follows a marketing and distribution franchise signed between Chrysler International S.A., and Central Registration Services Ltd., of Edinburgh. Chrysler International has its headquarters in Geneva. The company was set up more than two years ago by the Chrysler Corporation to market its products throughout the world, outside the United States and Canada. Central Refrigeration Services Ltd., has been established in Scotland for nearly seven years. Its principal activity has been the sale and installation of commercial refrigeration plants especially for cold storage and for self-service units and supermarkets. Mr. J. J. Garry who has been appointed technical sales manager of the Airtemp Division of Central Refrigeration Services Ltd., will be directing the distribution of the new ranges. These fall under nine main headings:

1. Radial room units condensing/compressor sets 15 to 100 hp with water cooled and evaporative condensers.
2. Radial compressor liquid chillers 35 to 100 hp.
3. Serviceable sealed liquid chillers $7\frac{1}{2}$ to 45 hp, air or water cooled condensers.
4. Serviceable sealed condensing units $7\frac{1}{2}$ to 15 hp, water and air cooled.
5. Hermetic compressor condensing units 3 to 5 hp water and air cooled.
6. Air handling units—200 c.f.m.—32,000 c.f.m.
7. Packaged air-conditioners, hermetic and serviceable sealed compressors air and water cooled 3 to 30 hp.
8. Packaged air conditioners, radial compressors, water and evaporative condensers 25 to 75 hp.
9. Hermetic and serviceable sealed compressor 3 to 15 hp for manufacturing projects.

* * *

Chemstrand Expand in Northern Ireland. Chemstrand Ltd. announce that their £3,500,000 Acrilan acrylic fibre plant, at Coleraine, Co. Londonderry, is to increase production capacity immediately by 50 per cent. from 10,000,000 lb. to 15,000,000 lb. of Acrilan a year.

Mr. John Sosa, general works manager at Coleraine, said that this is the first phase of a two-phase expansion plan and will be completed by mid-autumn of this year. Engineering design work has also been started to increase capacity to 25,000,000 lb. of Acrilan a year by the end of 1962. The reason given for the company's decision is the increasing demand for Acrilan in the textile industry at home and abroad.

Phase one will increase the firm's initial employment target of 400 by at least 17 per cent. and phase two by at least 38 per cent.

* * *

LEC'S SALES MANAGER



Mr. H. Underwood, M.I. Ex. (member of the Institute of Exporters) who has been appointed sales director of Lec Refrigeration Ltd., of Bognor Regis.

EASTWOOD MILL CO. LIMITED, REFRIGERATOR DIVISION

"M.R." learns that the refrigerator division of this company which was originally formed for the manufacture of service cabinets to the specification of refrigerator manufacturers, has since developed its own specifications and models designed to meet requirements and enquiries from the trade, education authorities, and similar specialized users.

The company is versatile and able to manufacture small quantities to specified requirements, and the standard models manufactured are designed to meet the demands from various service refrigerator users.

The models now manufactured are as follows:

Icemaker. This is a simple ice-making machine at low price, to manufacture ice in off-peak periods and to store it for use in catering establishments and for laboratory use.

13, 15 and 20 c.ft. Service Refrigerators. Current models have been designed to meet the requirements of users

R. A. BENNETT'S NEW OFFICE AND WAREHOUSE IN BROWN HILLS



R. A. Bennett & Co., offer the trade in the Midland Counties a full coverage of almost all the trade's day-to-day requirements plus a personal technical service.

Since 1947, when **Electronic Instruments Ltd.**, first established the direct-reading pH meter in the United Kingdom, they have pioneered each new phase of pH development culminating in the latest series of "Vibron" pH meters which the makers claim achieve unprecedented standards of accuracy and stability. In addition they have developed over the last 10 years a range of special electrodes with pH glasses especially designed for the research worker and industrial chemist. These are fully described in a new booklet entitled "pH Meters by E.I.L."

in school canteens, laboratories, stores etc. The 20 c.ft. cabinet particularly meets the varied requirements of this type of cabinet, having automatic defrost, magnetic door seals, and a low temperature range, occasioned by experience of school meals service requirements.

Deep-Freeze Storage Cabinets. These were originally designed with small farm industries in mind and are distributed for this purpose through one of the larger agricultural suppliers. Their modern appearance and full-width lid make them ideal for shop banker cabinets, and for hospitals and hotels.

Deep-Freeze Display Cabinets. These have been developed from an original requirement where deep-freeze storage combined with counter space was specified by a small shop-keeper. They are now available in various sizes with metal front, or glass front, and the latest model featured in this issue.

All the Emco machines are manufactured and assembled at the Hapton factory using rust-proofed sheet steel.



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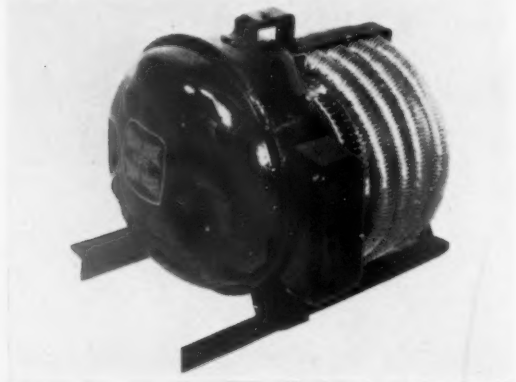


Ask Shell Chemical Company Limited,
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COMMERCIAL & INDUSTRIAL

Heat Pump & Refrigeration Ltd. introduces a series of new condensing units which they call micro-size. The units house Sterne-Tecumseh compressors, but the arrangement of the condensers is such that the basic dimensions have been considerably reduced. The range consists of units from 1/12-h.p. - 1/2-h.p.



As part of the continuing development of its sales organization **Electrolux Ltd.** has promoted nine members of its sales staff as area managers. The new area managers and the sales divisions in which they now operate are: R. H. B. Brown-sword (Western); T. A. Johnson (Southern); A. E. Shields (North East); C. E. Smith (South East);

The condenser coils are continuous tubes having no return bends, and the patented centrifugal fan draws air over the compressor and discharges it uniformly over the entire surface of the condenser. The condensers for the Pancake units have been placed adjacent to the compressors and for the 1/2-h.p. - 1/2-h.p. they have been placed above the compressors, and this location eliminates most fluff and dirt being deposited on the fins, thus improving efficiency.

J. Taylor (North West); J. J. Thomson (Western); K. Thorne (South Wales); J. S. White (London); J. B. Wilson (Southern).

* * *
Gloster vending machines, manufactured by **Gloster Equipment Ltd.**, a member of the Hawker Siddeley Group, have recently been installed in three of the workshops of H.M.

Hobson Ltd., Wolverhampton. In addition, their cafeteria has been fitted with a "bank" of vending machines to replace the confectionery kiosk. The "bank," a row of machines combined into a single unit—incorporates a VM.2 refrigerated milk machine, a VM.21 cigarette machine, a VM.22 candy machine, and a VM.20 "Tasty Twenty" candy vendor. The machines are intended to provide "Availability without loss of working time."

* * *

A new dewpoint measuring unit is announced by **Shaw Moisture Meters** for permanent installation to measure moisture in dry gas or air lines. A small flow of the gas or dry air of which the moisture content is required to be indicated or controlled, is taken through the measuring unit. The unit contains a replaceable ceramic filter and also the sensing probe which is connected to an indicating or recording instrument. The actual sensing element is despatched in a sealed packing in which it is stored until after the measuring unit is installed and purged with dry gas for an hour or two to dry it. No attention whatever is needed, and the range of the instrument is such that no gas has yet been encountered in practice which is too dry for the moisture to be indicated. As the range is down to -150°C . dewpoint there are many applications for the new device in Atomic power stations, Chemical, Semiconductor, Refrigeration, Food, Metallurgical and Radio Valve manufacturing industries. The price is £10 and delivery is from stock.

Jablo Increases Production. The rapid development of expanded polystyrene production, which has grown into an industry of its own, and of which Jablo Plastics Industries Ltd., have been the pioneering company for well over 10 years, has forced them to enlarge the manufacturing facilities at their Croydon works. 25,000 sq. ft. has recently been added to their factory and approval for extension for a building of over 30,000 sq. ft. has just been obtained. Backed by Jablo Propellers Ltd., a fully controlled subsidiary, the manufacturing of all the specialised equipment for expanded polystyrene production, has been a special success of the Jablo Group. The special plant they developed for all operations, has proved to be most efficient. With simple, but efficient machines, continuous large-

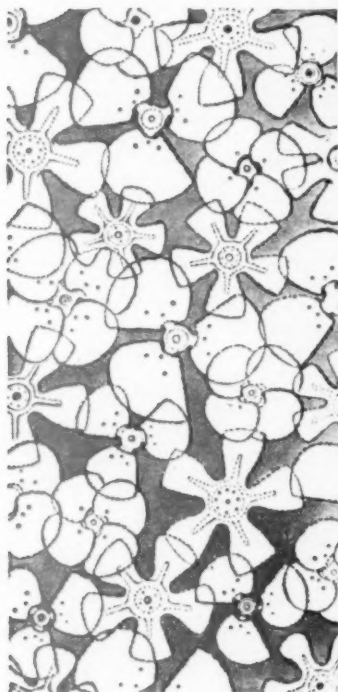
scale production of Jablite blocks up to 12 ft. by 4 ft. is an established routine operation, and capacity of some 40,000 c.ft. per week is easily available which will also take care of the growing demand for other Jablo products particularly Jablestos panels, insulated flush doors and transport containers. In view of such expansion, the company is now in a position to offer to the trade reasonably priced, moulded blocks, which will be announced in their advertisements. As the material is easily cut with ordinary commercial band saws, it is an interesting proposition for any firm with such equipment to purchase complete blocks and cut them to size, in accordance with specifications they may receive from customers. This saves the necessity of stocking an assortment of boards in different

sizes and thicknesses. With a small consignment of full-size blocks, immediate requirements can be covered, and therefore time and delivery charges can be saved. For contractors who are interested in Mediterranean, African and Eastern countries, the facilities which the Jablo organization has now opened up with their new factory in Malta, are of great interest, as this will mean that the excessive transport charges for voluminous material such as expanded polystyrene, can be greatly reduced. A further interesting development is now on the way in Ireland, where a factory of approximately 80,000 sq. ft. will soon be in a position to supply not only insulation material as such, but all other products which the Jablo Group has developed for the refrigerating and building industries.

PROPELLER FANS?

YES, SIR

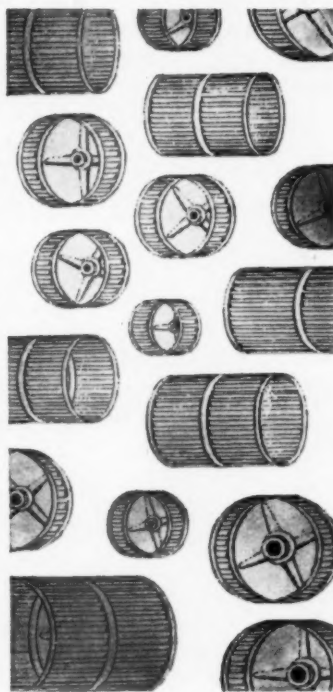
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IN THE COUNTRY**



AIROTORS?

YES, SIR

**BIGGEST RANGE
IN THE COUNTRY**



BOFFINS?

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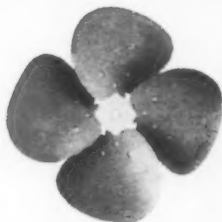
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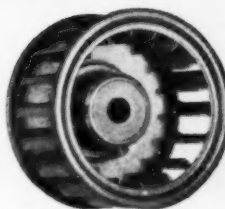
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Frozen foods, Ice cream, Fish, Meat, Poultry and other perishables are carried, kept fresh, safe and inviting by the use of Winget-Dole Holdover Plates made specially for the purpose. This type of bus is built by K.F's Butiksbussar, Västerås and the buses are sold to Konsum Livs Societies for the purpose of giving good mobile self-service.

Low temperature Conservators, Fish and Meat Lockers and Display Cabinets all incorporate Winget-Dole Holdover Plates.



The sale and distribution of Winget-Dole Holdover Plates is handled by our representative Industrial Products Inc. AB, Sveavagen 163, Stockholm.

Winget-Dole Plates are also distributed throughout Norway and Denmark.

**Ask YOUR Refrigeration Supplier about
Winget-Dole Transport and Display Plates.**



Winget Refrigeration Limited, Rochester, Kent.
Telephone: Strood, Kent 7276. Grams: Wingetism, Rochester.

Following the outstanding success of several new projects, the old established company of C. W. Brown (Engineers) Ltd., have acquired an imposing new factory at 420/422 Ware Road, Hertford. New plant has been laid down to facilitate increased production of all types of evaporator and condenser coils for the refrigeration and air-conditioning industry. A new department has been set up to develop new solutions to cold store entry problems. The range of air curtain equipment marketed by this department is proving a great success and units are being installed at many leading cold stores. Research facilities have been provided to develop thermoelectric cooling devices. Economics at present limit this revolutionary



method of refrigeration to speciality electronic and medical applications. A thermoelectric cooling unit used as a microtome cold stage is

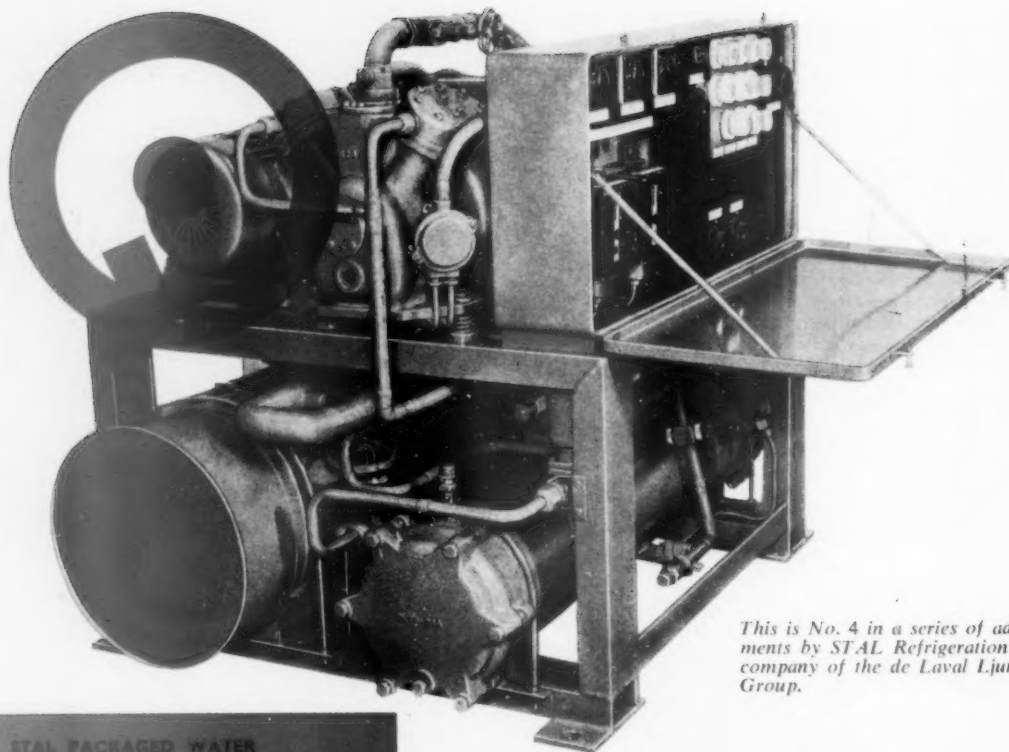
A view of the main fabrication shop.

at present operating. The freezing table is 1½-in. diameter and may be cooled to any desired temperature down to -20° C.

Isol have a range of deep freezers specifically designed for the home. These homefreezers are adjusted by the producers for automatic operation in the range of -4 to -13 for the whole cabinet. The greatest freezing capacity is in the deepfreezing compartment. Temperatures may be reduced further by adjusting the thermostat. The Isol homefreezer

has six main features the cabinets have casters on roller bearings; specially designed baskets and plastic nets are supplied for easy handling; a signal lamp indicates when current supply is satisfactory; the lid may be stopped in any position when opened; safe transport is ensured through strong export-type packing and a plastic cover; the

cover can be locked. Cabinets are available in four sizes. Model H.180 has a capacity of 6.3 (c.ft.) and retails at £125. Model H.350 has a capacity of 12.3 (c.ft.) and retails at £140. Model H.460 has a capacity of 16.2 (c.ft.) and retails at £210, and model H.585 has a capacity of 20.6 (c.ft.) and retails at £240. All prices include p.t. and a service fee.



This is No. 4 in a series of advertisements by STAL Refrigeration AB—a company of the de Laval Ljungstrom Group.

STAL PACKAGED WATER CHILLERS INCORPORATE:

Balanced multi-cylinder, direct-driven compressors for even gas flow and smooth, silent operation. Low capacity units include semi-hermetic compressors with heavy duty motors.

Chillers and condensers of water-in-tube type for maximum heat transfer and minimum pressure drop. Removable end covers and Muntz-metal tube plates.

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For many industrial processes requiring controlled temperatures, the use of cold water is most suitable as it permits accurate temperature regulation.

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STAL offer a complete line of package water chillers for such industrial applications as well as for air-conditioning plants.

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New Companies

The accompanying particulars of New Companies recently registered are taken from the Daily Register compiled by Messrs. Jordan and Sons Ltd.

Refrigeration Spares (Manchester) Ltd. Nominal capital: £4,000 in £1 shares. Directors to be appointed by the subscribers. Subscribers: Marion Simmons and Gwendoline G. Ellston (Secretary), 59/67, Gresham Street, E.C.2. Registered by Solicitors: Linklaters & Paines, 59/67, Gresham Street, E.C.2.

Beattie (Coldrooms) Ltd., 20/26, Wilton Street, Liverpool, 3. Secretary: Geo. C. Beattie. To carry on business of refrigeration and cold storage engineers, etc. Nominal capital: £500 in £1 shares. Solicitors: Canter, Levin & Mannheim, Liverpool. Directors: Geo. C. Beattie, 13, Wango Lane, Aintree, Liverpool; Arthur Johnson, 50, Rimmer Avenue, Liverpool, 16.

Refrigeration Services (York) Ltd., 1, Lord Mayor's Walk, York. Secretary: C. D. Ardley. To carry on business of manufacturers of and dealers in electric equipment, etc. Nominal capital: £500 in £1 shares. Directors: Frank McGarry, Cromwell Hotel, Micklegate, York; Cyril G. Croft, 13, Elmpark Vale, Stockton Lane, York; Charles D. Ardley, 36, Ainsty Avenue, York.

M.E.C. (Refrigeration) Ltd., 82/4, New King's Road, Fulham, S.W.6. Secretary: Mary I. Corfe. To carry on business of manufacturers of and dealers in refrigerators, etc. Nominal capital: £100 in £1 shares. Permanent directors: Maurice E. Corfe and Mary I. Corfe, Regency House, Old Bath Road, Colnbrook, Bucks.

Eddison Refrigeration Ltd., 1, Beaconsfield Parade, Beaconsfield Road, Brighton. Secretary: Arthur D. Wood. To carry on business of heating and ventilating engineers and consultants, etc. Nominal capital: £2,000 in £1 shares. Directors: John S. Eddison, 12, Fitzalan Road, Littlehampton; Colin F. Maxfield, 4, Florence Road, Brighton.

Annis Refrigeration Ltd., 42, Oxford Street, Whitstable, Kent. Secretary: Mrs. D. V. Annis. To take over "Annis Refrigeration" carried on at Whitstable, Kent. Nominal capital: £1,000 in £1 shares. Directors: Dennis L. Annis and Mrs. Doris V. Annis, 12, Westcliffe, Whitstable.

J. & T. Spiers (1961) Ltd., Bovoy Works, Bovoy Street, N.7. Secretary: G. M. Bradman. To carry on the business of refrigeration, heating and ventilating engineers, etc. Nominal capital: £100 in £1 shares. Director: Jack Oldham, 22, Malvern Drive, Woodford, Essex.

L. R. Duncum & Co. Ltd., 199, Godstone Road, Whyteleafe, Surrey. Secretary: Robert W. B. Kneen. To carry on business of electrical engineers, general electric and refrigeration contractors, etc. Nominal capital: £100. Directors: Leslie R. Duncum and Mrs. Jean B. Duncum, 107, Mead Way, Coulsdon, Surrey. Solicitors: Robert Kneen & Co., Whyteleafe.

Edward England (Refrigeration) Ltd., Suite No. 6, 4, French Row, St. Albans. Secretary: D. J. Baker. Nominal capital: £500. Directors: Edward R. England and Mrs. Audrey England, 9, The Mall, Park Street, St. Albans.

PATENTS

APPLICATIONS RECEIVED

November 25—Colt (Engineers) Ltd., W. H. Sumerton, T.P., P40515, Refrigerators. 26—Normalair Ltd., Rogers, B. H., P40711, Air-conditioning systems. 28—Cellico, A. B., C40750, Refrigerating systems heat transfer methods, etc. December 1—Fowler, K. J. V., P41264, Air-conditioning systems apparatus; Licentia Patent-Verwaltungs-G.m.b.H. Beikert, H., Brand H., and Roth, K., C41356, Refrigerator, etc. thermostats; Temperature Ltd., McDonald, D. A., P41374, Air-conditioning apparatus. 2—Unilever Ltd. Sale, P. F. C., P41558, Grozen products preparation. 6—Licentia Patent-Verwaltungs-G.m.b.H., C41973, Refrigerating equipment. 7—Prestcold

(Midlands) Ltd., Fielding, E. C., Laight, D. H., and Pooler, G., P42071, Refrigerating means. 9—Garrett Corporation C42525, Refrigeration systems. 17—Hall & Kay Ltd., Hall H. D., and Hall, S., P43519, Air-conditioning apparatus filters. 19—Ellis, B. C., and Henry A., P43585, Air-conditioning systems. 20—Bosch, G.m.b.H., R., C43822, Refrigerating apparatus; "Licencia" Talalmanyokat Ertekisito Vallalat, C43705, Air condensation apparatus heat exchangers controlling; C43706, Air-cooled condensation pressure adjusting means; C43707, Air vent valve freezing-in preventing means. 21—De Havilland Aircraft Co. Ltd., Thornton, J., P44016, Thermoelectric cooler unit. 29—Electrolux Ltd., C44580, Absorption refrigerating apparatus; Warren Webster & Co. Inc., C44559, Air-conditioning system. 30—Howard, R. E., P44818, Domestic air-conditioning unit; Mills, M. P., P44873, Refrigerators, etc. 31—Sterne & Co. Ltd., Pearson, S. F., P44901, Refrigeration apparatus. January 2—Morphy-Richards (Astral) Ltd., Ferguson, J. R., P43, Refrigerators. 3—Shockley, W., C257, Temperature control system. 20—Electrolux Ltd., C2340, Refrigerating apparatus. 25—G.M.C., C2913, Refrigerator. February 2—Borg-Warner Corporation, Elliot, P. F., and Longman, C. W. F., P4026, P4029, P4030, P4031, P4032, P4033, Refrigerators, etc. 14—Kenwood Manufacturing (Woking) Ltd., Elliot, P. F., and Longman, C. W. F., P5519, Refrigerators, etc., cabinets; Kenwood Manufacturing (Woking) Ltd. Griffiths, A. R., and Longman, C. W. F., P5526, Refrigerators; Kenwood Manufacturing (Woking) Ltd., Elliot, P. F., and O'Beirne, R. B., P5525, Refrigerator etc., cabinets; Kenwood Manufacturing (Woking) Ltd., Longman, C. W. F., P5520, P5524, Refrigerators; Kenwood Manufacturing (Woking) Ltd., Longman, C. W. F., and O'Beirne, R. B., P5521, P5522, Refrigerator washing machines and other domestic appliances; Kenwood Manufacturing (Woking) Ltd., Longman, C. W. F., and Robinson, R. W., P5523, Refrigerators. 15—Alaska-Werk Dieter Schildbach Komm-Ges., C5684, Temperature control of Refrigerators; Rubery, Owen & Co. Ltd., Ascott, W. H., and Fletcher, J., P5560, Cabinets for refrigerators, etc.

COMPLETE SPECIFICATIONS ACCEPTED

December 14—Conch International Methane Ltd., 860,723, Low temperature refrigeration. 21—Fenton, Byrn & Co., Ltd., 861,068, Installations for ventilating, air-conditioning and the like. 29—Normalair Ltd., 861,722, Air-conditioning systems for vehicles; Westinghouse Electric Corporation, 861,732, Refrigeration apparatus; Coblenz R. C., 861,723, Air-conditioner for air compressors. January 11—Walter Cassey Ltd., 862,427, Releasable fastening for doors and the like, January 15, 1959—Burnett & Rolfe Ltd., 863,021, Cooling devices. August 2, 1957 (August 9, 1956)—Whirlpool Corporation, 864,793, Thermostatically controlled refrigeration systems. March 11, 1959—General Motors Corporation, 864,574, Refrigerator. February 22—Hubbell Corporation, 865,457, Pressure and temperature responsive pilot valve for refrigerating systems; General Electric Co. Ltd., 865,528, Refrigerators; General Motors Corporation, 866,140, Household refrigerator.

A booklet entitled "Making Polyzote Mouldings." has been issued by Expanded Plastics Ltd. Polyzote (expanded polystyrene) is marketed in the form of boards, pipe sections, mouldings and expansible granules. The object of the booklet, which is illustrated, is to explain the methods by which the best use of Polyzote expansible granules may be obtained.

GERMAN COMMERCIAL PLANT BOOK

This is the second and improved edition of *Die Klein-kaeltemaschine (The small refrigeration machine)*, by Professors Plank and Kuprianoff, first published in 1946. It gives a comprehensive survey of the construction of small and medium sizes of refrigerating machines and refrigerated equipment; this should be of the utmost value to technical and craft schools. The whole field of applications is surveyed from very low temperature to air-conditioning, medical applications and dehumidifying. The

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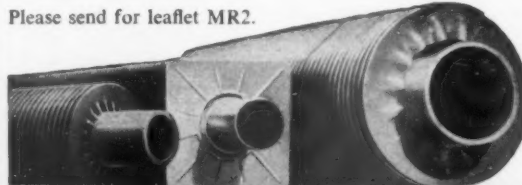
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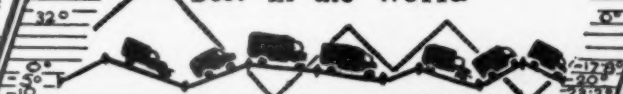
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Book Review

"THE ENGINEER" GUIDE

The 1961 edition of "The Engineer Buyers Guide" is now available. There are 1,860 entries, representing all branches of industry, providing buyers with a valuable and up-to-date list of suppliers of a wide variety of engineering and industrial products and services.

The buyers guide section of 752 pages contains over 35,100 entries arranged under approximately 2,700 classified headings, with 1,600 helpful cross references. In addition, many other essential details concerned with the engineering industry are listed. The "guide" is ob-

tainable either directly from the publishers or from local newsagents. The price is 10s. (plus 2s. postage).

* * *

Extension of BIMCAM.—The British Industrial Measuring and Control Apparatus Manufacturers' Association (BIMCAM) which was established in 1944 to serve industries in their instrument requirements, has set up a specialized section of its organization to provide technical advice and assistance in all industrial instrumentation problems. Dissemination of vital information to the whole of industry is a major activity of BIMCAM. This is achieved by world-wide circulation of informative literature on the activities of its

members, and the organizing and sponsoring of exhibitions, displays and conferences. The International Instruments, Electronics and Automation Exhibition of which the Association is a co-organizer, is attended by its members, while smaller displays and conferences held at intervals throughout the United Kingdom ensure that the heart of British Industry in the provinces is kept fully informed of the latest developments by its members. The Association's offices are at 9 Argyll Street, London, W.1.

The collective activities of the members of BIMCAM contribute in no small measure to the maintaining of British ingenuity as the leader in world engineering.

AUTOMATIC SOLVENT DEGREASING PLANT

TRICHLORETHYLENE and perchlorethylene have been recognized for many years as being two of the most effective degreasants available to industry. They have proved of particular value in all kinds of engineering for removing from metal components everything from light machining oils to heavy grease coatings. Their effectiveness can vary, however, according to the means of application, and Dawson Bros. Ltd., paid particular attention to this fact in the development of their range of automatic solvent degreasing plant. The Dawson machines which are suitable for use with either trichlorethylene or perchlorethylene provide a method of rendering all kinds of metal parts chemically clean and dry without the use of water, detergents or hot air drying. The operation of the machines is simple and speedy and the closely controlled treatment ensures that the parts are completely degreased and moisture-free for any subsequent process such as painting, plating, etc. Oils and greases and any solids held in suspension by them are completely removed from all the surfaces, recesses and seams.

The application can be by the suspension of the parts in solvent vapour, or a combination of this and immersion in boiling solvent. For superfine immersion cleaning, a transducer unit can be incorporated to set up ultrasonic vibrations in the solvent. Machines can be supplied incorporating solvent spraying sections. The choice of which method to employ will depend on the amount of grease, oil and solids on the parts being cleaned, and the processes they are to receive after cleaning.

Solvent is used in direct proportion to the weight of work, and the Dawson machines are designed to ensure that consumption is kept to the absolute minimum.

Furthermore, the totally enclosed construction of the Dawson machines and the various safeguards incorporated in them ensure that loss of solvent to atmosphere is virtually eliminated.

As with most other industrial operations today, the Dawson solvent degreasing plant can be classified into two types, 1. Continuous operation, 2. Batch operation.

DAWSON CONTINUOUS SOLVENT DEGREASING PLANT

In these machines the parts being handled are automatically taken through the degreasing process in carriers attached to a moving conveyor. Special loading and unloading facilities and other automatic handling devices are very frequently built into the machines to match up with existing handling arrangements already in use. Machines of this type are available incorporating solvent degreasing for use in conjunction with acid pickling, phosphate coating, bonderizing and other pre-

treatment processes in any of a variety of combinations. Solvent spray sections can also be included in this plant.

The following technical details describe standard continuous operation machines incorporating a double immersion and vapour degreasing treatment, but most of this information is also true for single immersion vapour machines and machines for vapour degreasing only.

These machines are available for through or return operation as the diagram shows. With the through type, the parts are loaded by an operator at one end of the machine, and are carried through the treatment to be unloaded by a second operator at the other end. On the return type, the parts are loaded and unloaded at the same end of the machine by one operator.

Conveyor

The conveyor consists of two continuous chains fitted with evenly spaced carriers. These carriers can be in the form of cylindrical baskets or hanging fittings.

Cylindrical Baskets—These cylindrical baskets can be fixed to the chains for direct loading and unloading or detachable so that the basket of clean parts is removed from the conveyor and replaced with a basket of soiled parts. They are available for rotation during treatment or for non-rotation, in which case they simply pivot retaining the same gravitational disposition throughout their journey through the machine. The method of rotation is simple and foolproof. Sprockets on the ends of the baskets contact chains fitted along the course of the conveyor in the treatment zone, providing smooth rotation throughout the cleaning process. This revolving action moves the parts around inside the baskets, thus ensuring that the solvent flows freely over all the surfaces of the parts and penetrates all the deep drilling holes and other recesses. Where this tumbling action might damage the parts concerned, non-rotating baskets are recommended.

Hanging Fittings—These are available as work-carrier basket fixed to the conveyor or as holders to receive removable trays specially designed for given components. These simply pivot between the conveyor chains as they travel through the machine constantly retaining an upright position.

The machines can be supplied with several different types of carriers both rotating and non-rotating to suit the range of parts being cleaned.

Drive

The conveyor is driven by an electric motor and reduction gearbox. On the larger machines a magnetic clutch is often fitted. Power transmission is through chains and sprockets

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to provide positive movement of the conveyor chain, and tensioning devices are fitted at suitable points for easy adjustment when necessary.

Conveyor Speed

Above a certain speed, the conveyor would tend to bring vapour above the cold strata with the consequential loss of solvent. This cannot happen in the Dawson machines as the conveyor never operates above the maximum speed for safety.

Operation

The operator loads the carrier or places a loaded carrier into position according to whether the machine operates on the fixed or detachable carrier method. He then presses the starter button which indexes the conveyor, and all the carriers attached to it, through one pitch, bringing forward a carrier of clean parts to the unloading position; this is emptied or removed and the next batch of soiled parts is loaded, and this cycle of loading and unloading operations continues, each time indexing the parts a further stage through the cleaning process. An important feature of the Dawson machine, is that the process time is under the control of a time clock, thus the operator cannot advance the conveyor until the timed period is completed. This guarantees that the parts receive the full treatment which the machine was designed to give them.

Treatment

The carriers first enter the vapour zone where degreasing commences as the vapour condenses on the parts as pure solvent. They then move into the first immersion tank where the brisk boiling action and the natural degreasing power of the solvent removes the grease, oils and solids suspended in them. They then emerge from the liquid into the heavy vapour where the cleaning and degreasing action continues and then enter the second immersion tank of clean boiling solvent, which is being constantly refreshed by the entry of pure solvent flowing from the condensing coil. This immersion treatment thoroughly and searchingly rinses the parts clean of all traces of soilage before they emerge and pass finally through the heavy solvent vapour. When the parts pass out of the vapour, the heat imparted in the treatment, combined with the volatile character of the solvent enables them to dry quickly and completely before they reach the unloading position. The cleaned parts will be completely odourless.

Continuous Distillation System

A notable feature from both an economical and a space saving view point is the continuous distillation system built integrally into these machines. This is a considerable improvement on other machines of this type where the still is a separate unit. This in-built distillation system ensures the maximum

possible recovery of vaporized solvent and by a system of overflows, it weirs surface dirt and sludge from the immersion tanks into a still tank. The rising vapour from the boiling solvent in the two immersion tanks and in the still tank enshrouds the carriers and their contents and rises into contact with the condensing coil which converts it into liquid solvent. This falls into a trough and is returned through a water separator to the second immersion tank thus constantly replenishing and refreshing the solvent already there. From there the solvent weirs over the first immersion tank and the surface oil and scum on that tank flows into the still. Therefore, the soilage collects in the still for easy removal at cleaning-down times through the cleanout doors provided, and the actual operating tanks are kept free of excessive soiling.

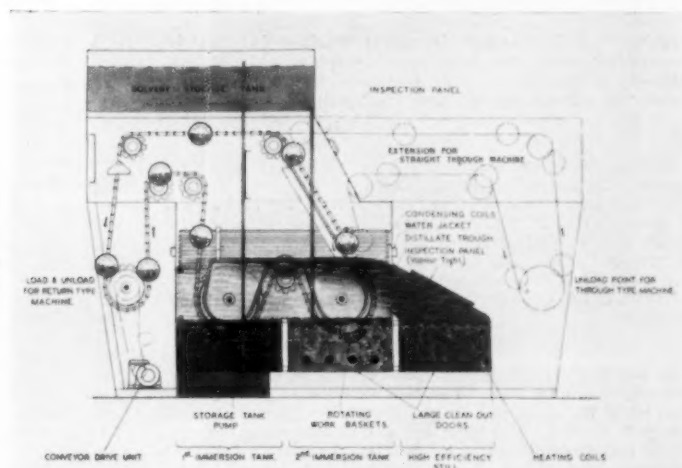
The condensing coil is copper tubing through which cold water is continually circulating and this, together with a water jacket girting the outside of the tank level with the coil, and connected to the same cold water supply, provides a complete cold-strata which condenses the vapour and allows none to escape to atmosphere. If for any reason, such as a failure in the water supply to the condensing system, the vapour should tend to rise above the desired level, a thermostat is fitted which will automatically switch off the heating supply in the immersion and still tanks. An additional important safety feature is a thermostat fitted in the water out-flow from the condensing coil; if the temperature of that water rises above the level for effective condensation of the vapour, then the thermostat operates a circuit which automatically increases the flow of water through the condensing coil system. This is a great improvement over other systems in that the flow of water is automatically adjusted to suit the work passing through the machine. For example, less vapour condenses on light parts than on heavy parts, therefore, where a variety of parts are being handled the amount of vapour rising to the condensing coils could vary considerably; the Dawson system ensures that only the minimum amount of water necessary for cooling is used, whereas on other machines where the flow of water through the coils is manually fixed to suit the lightest work handled, the water consumption is much higher than necessary.

These safety provisions which ensure that vapour does not escape to the atmosphere both protect personnel from the possible toxic effects of the fumes and ensure that there is a minimum loss of solvent.

Thermostats

In addition to the vapour and water flow thermostats described above, low level thermostats are fitted in the two immersion tanks and in the still tank. The purpose of these low level thermostats, and particularly of that in the still tank is to cut off the heating medium if the solvent should rise

Operation diagram for double immersion/vapour machine. This shows return type machine, and dotted section indicates arrangement for straight through machine.



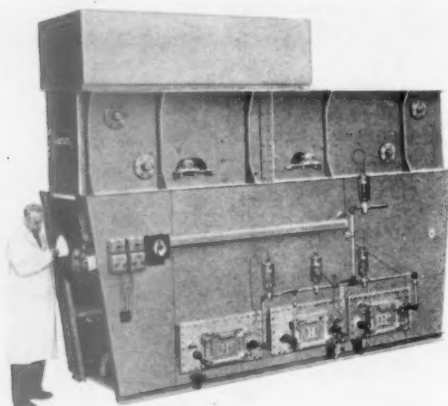
above 248° F. (owing to accumulation of oil). Heating above this temperature will ultimately decompose some of the solvent, and the acid formed will attack the plant; it is important, therefore, that these thermostats should always be covered with solvent, and to facilitate this, a float type level indicator, connected to the still tank shows, at a glance, the level of solvent.

Construction

These machines are made to the well renowned high design and engineering standards common to all Dawson plant, and they are of a complete packaged construction, ready for immediate connexion to your services. All heating, water and electric lines are taken to a common connecting point.

Construction can be in stainless steel, or galvanized mild steel according to requirements. Dawson Bros. Ltd., state, however, that they prefer to supply the conveyor chain in stainless steel, but that if required, alternative materials can be supplied.

Easy access to the interior of the machine is provided by large, quickly removable, cleanout doors on the sides of the tanks, and large detachable panels in suitable positions on the outside of the machine. An important feature of machines for steam or high-pressure hot water, is that the heating coils are mounted on easily removable plates bolted to the sides of the tanks. This enables the coils to be removed from outside without the need for personnel to enter the tanks. The cleanout doors mentioned above are fitted into these removable plates.



Double immersion/vapour degreasing machine for straight through operation, the parts being loaded at one end and removed at the other. This particular machine is shown with the solvent storage tank (optional) fitted on top.

Heating

Heating can be by steam as shown in the diagram or by high-pressure hot water, or electricity.

Dawson steam heated solvent degreasing plant is designed to operate at 30 lb. p.s.i. (dry saturated gauge), and pressure should be regulated accordingly. Machines can be supplied for pressures lower than 30 lb. p.s.i. if necessary.

In the case of high-pressure hot water, the manufacturers can provide the necessary control gear on learning details of the supply.

Storage Tank

As the diagram shows, the machine can be fitted with a pure-solvent storage tank. This tank which is an extra can be fitted at the top of the machine as shown, or at the side either closely or remote. This feeds the second immersion tank by gravity and from there the solvent weirs over into the first immersion tank, which in turn overflows into the still tank, thus all three tanks are filled to the required level.

A pump can be supplied for the convenient refilling of the storage tank from floor level.

Cleaning Down

The frequency of the cleaning down periods will vary according to the amount and nature of the work with which the machine has to cope. At cleaning down times, the inbuilt-distillation plant distils all the solvent in the tanks, and the pure solvent is carried from the trough beneath the condenser coil into a small tank integrally built into the machine and fitted with a magnetic float and pump. From there it is pumped into the main storage tank.

When this distillation process has reduced the depth of the solvent in the immersion and still tanks to the level of the heating coils, the supply to these is cut off and auxiliary heating elements fitted on the under-side of the tanks come into operation.

These elements enable all the remaining solvent to be distilled thus effecting complete recovery.

The sludge deposits in the tanks are easily removed through the cleanout doors.

Carrier Sizes and Outputs

There are three standard sizes of machine and the following table gives carrier sizes and hourly outputs. This information is common to both the single-stage and double-stage machines.

	Carrier size (cylindrical basket type)*	Carriers Handled per hour
Size 1	8 in. dia. × 12 in. long	40
Size 2	12 in. dia. × 15 in. long	60
Size 3	12 in. dia. × 24 in. long	90

*The sizes of special fittings or baskets will be within the dimensions given for cylindrical baskets.

AUTOMATIC DEGREASING PLANT

For Batch Operation

This machine is suitable for those small scale applications where the requirements are for flow-line production. It is available as a vapour machine as shown in the diagram, or as an immersion/vapour machine. The construction is on the same robust, reliable lines as the conveyor machines, and the design is thoughtfully conceived to provide efficient degreasing, simple operation and absolute maximum economy in solvent and full and easy access for cleaning down.

It is available in three sizes as shown below.

Size 1.

1 Basket 18 in. square × 12 in. high.
Maximum weight load of 75 lb.

Size 2.

2 Baskets 18 in. square × 12 in. high.
Maximum weight load of 150 lb.

Size 3.

3 Baskets 18 in. square × 12 in. high.
Maximum weight load of 225 lb.

*Machines not using baskets are fitted with a suitable grid for the direct loading of the work. The dimensions of work so handled can be up to the overall sizes of the baskets as shown above, e.g. the size three machine will handle components up to 4 ft. 6 in. long × 1 ft. 6 in. wide × 1 ft. high, assuming that the weight does not exceed the maximum shown.

Operation

The operator pushes the work to be cleaned on to a pneumatically operated platform and presses a starter button. This lowers the platform down into position in the treatment zone where it remains for a fixed period predetermined by an automatic timer. The solvent (either vapour or immersion vapour according to the machine) dissolves the grease and oil which fall to the bottom of the tank. At the end of the cleaning period, which is fixed to suit the condition of the parts being cleaned, the platform is automatically raised out of the treatment zone, to the unloading position. The upward speed of the platform is fixed at a safety level to eliminate the possibility of vapour being brought out of the machine. The operator pushes the next batch of soiled parts on to the platform thus discharging the clean parts on to a roller track at the other side. Sizes 2 and 3 can be arranged for in-line or transverse operation.

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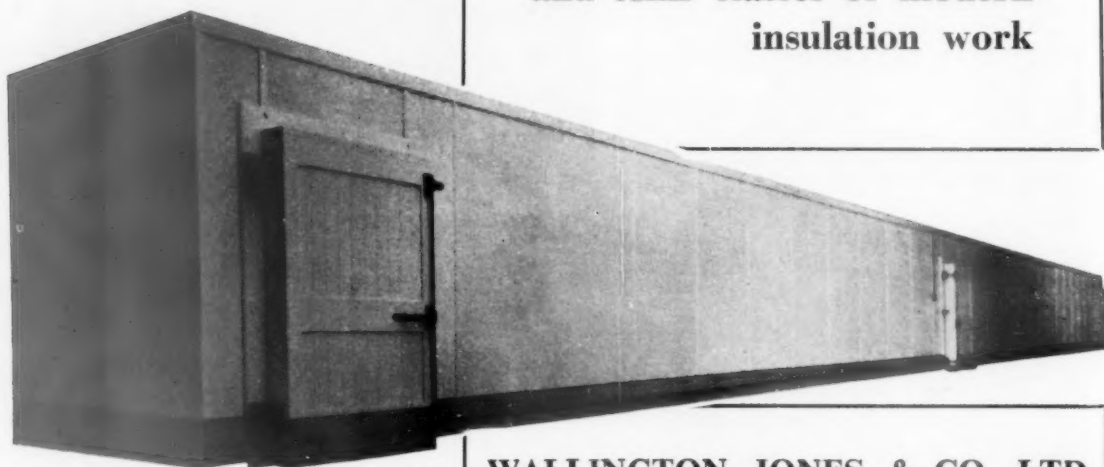
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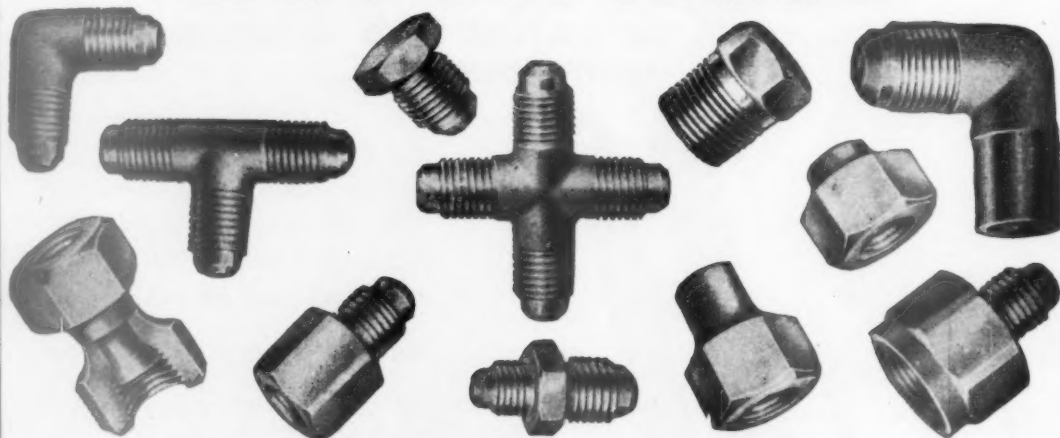
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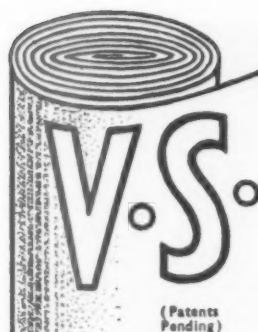
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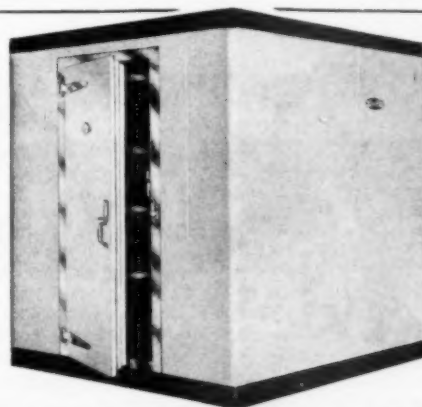
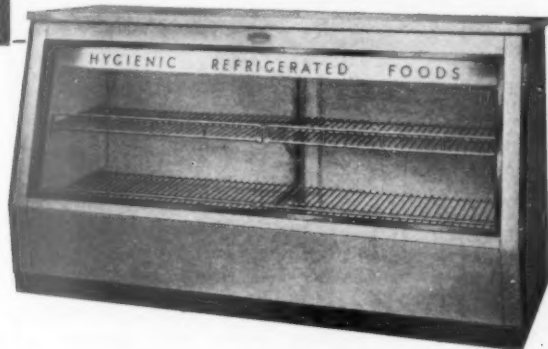
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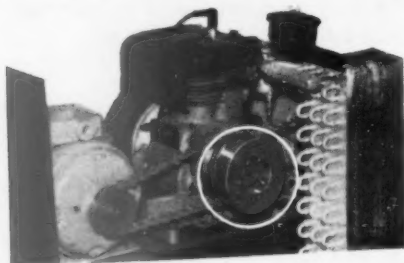
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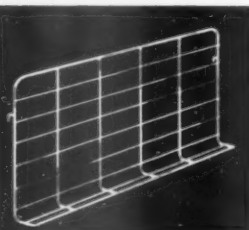
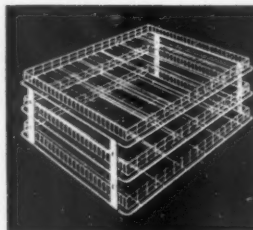


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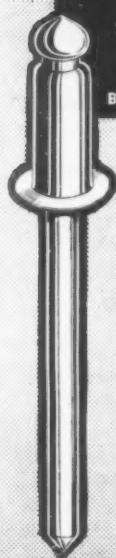
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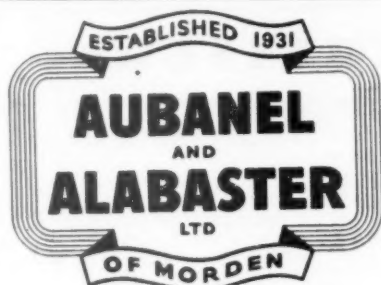
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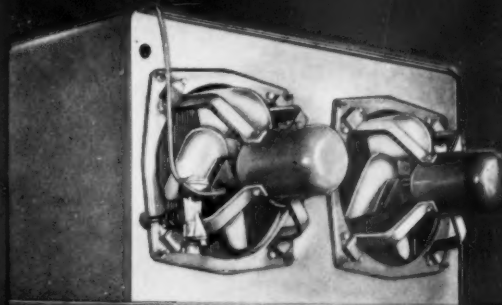
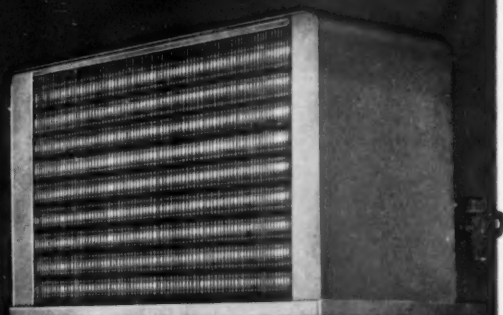
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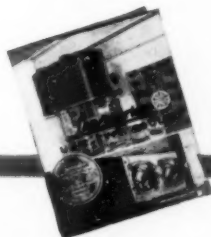
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